

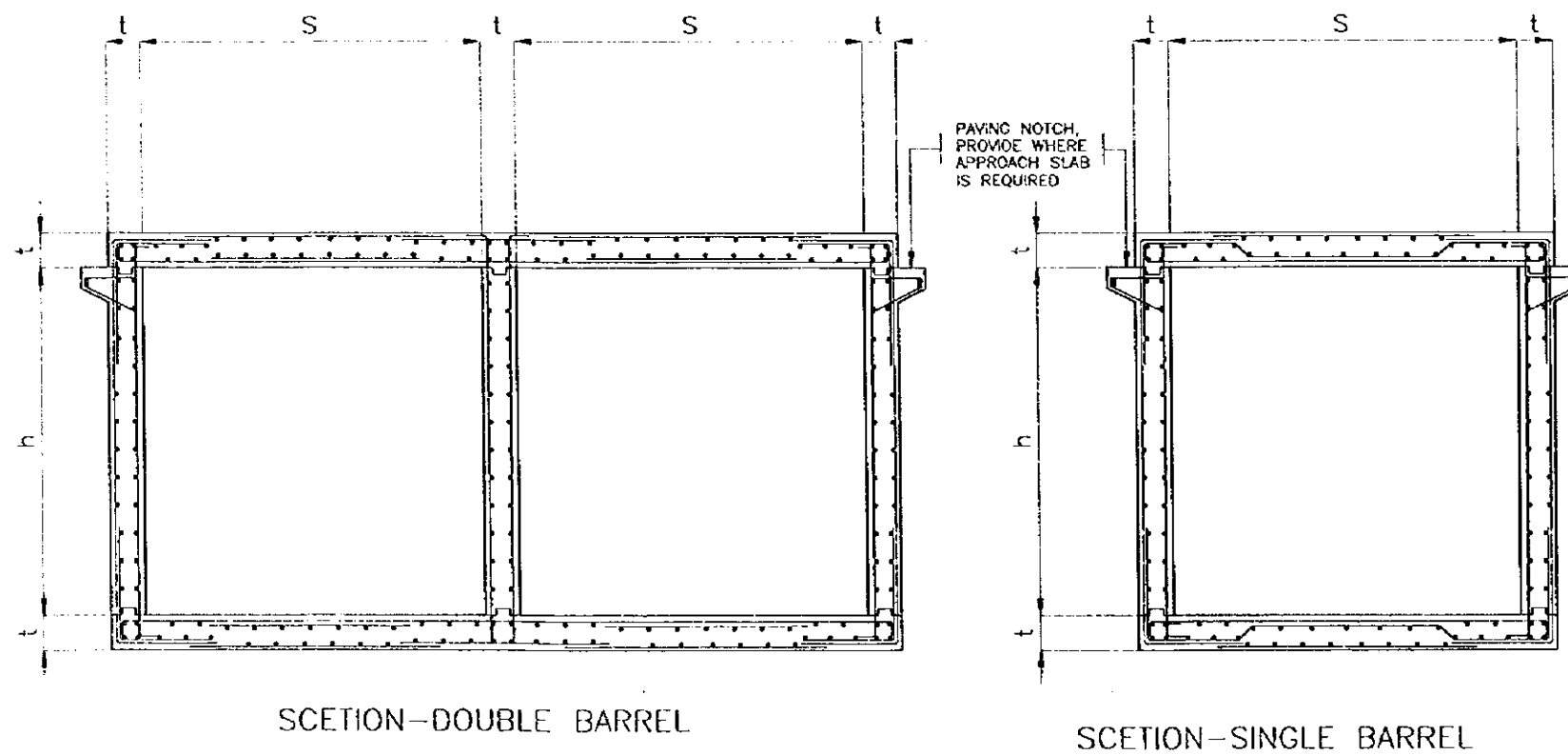
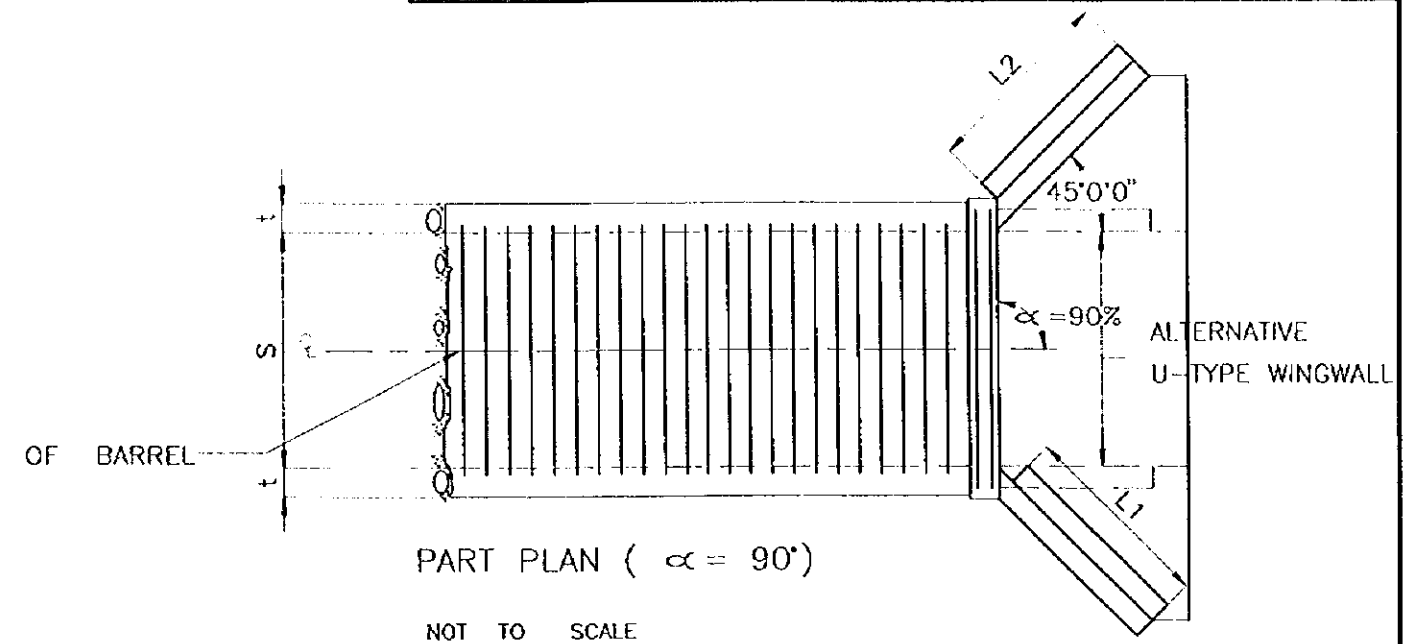
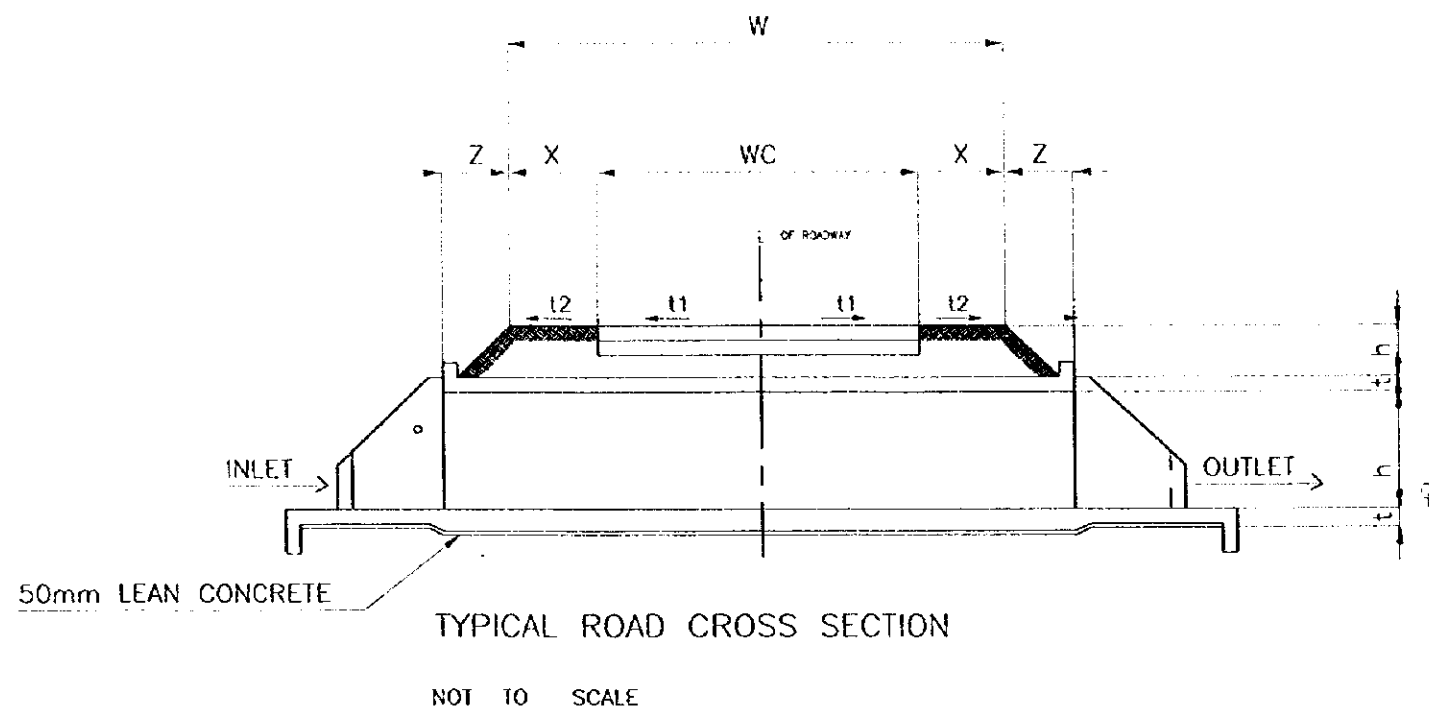
4. DRAINAGE

FEASIBILITY STUDY ON ROAD IMPROVEMENT AND REHABILITATION IN GRENADA

SCALE:
Not to Scale

R.C. BOX CULVERT

DRAWING NO.
D-1



STANDARD REINFORCED CONCRETE BOX CULVERT

NOT TO SCALE

SINGLE BARREL BOX
DOUBLE BARREL BOX

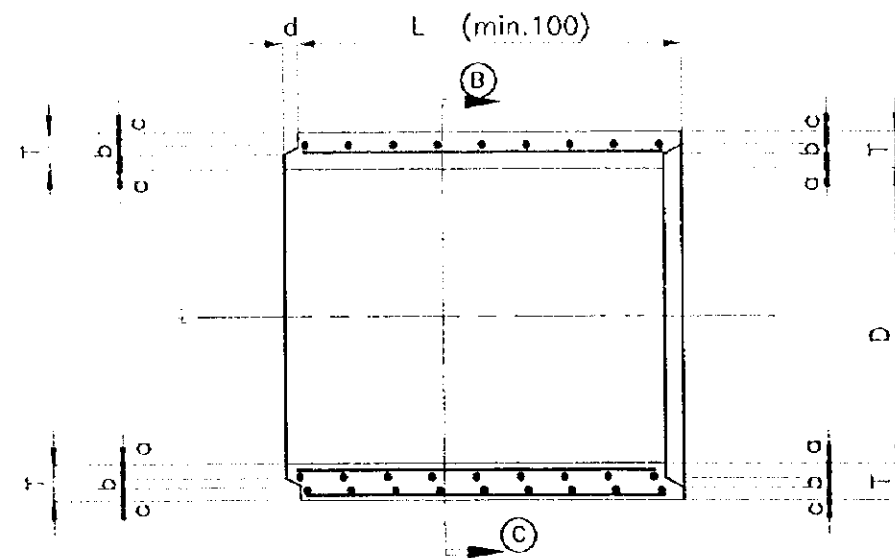
CLLAR			
SPAN S	HEIGHT h	t	t
1250	1000	180	180
	1250	180	180
	1500	180	180
	1800	180	180
1500	1000	180	280
	1250	180	280
	1500	180	280
	1800	180	280
1800	1250	200	300
	1500	200	300
	1800	200	300
	2100	200	300
2400	1800	220	300
	2100	220	300
	2400	220	300
	2750	220	300
3000	2100	280	300
	2400	280	300
	2750	280	300
	3000	280	300

FEASIBILITY STUDY ON ROAD IMPROVEMENT AND REHABILITATION IN GRENADA

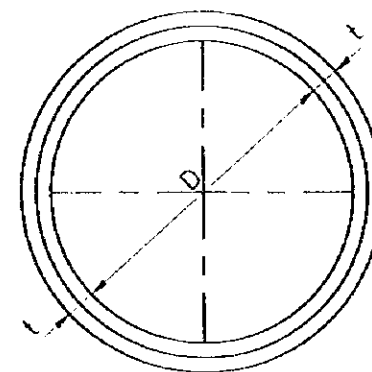
SCALE:
Not to Scale

R.C. PIPE CULVERT

DRAWING NO.
D-2

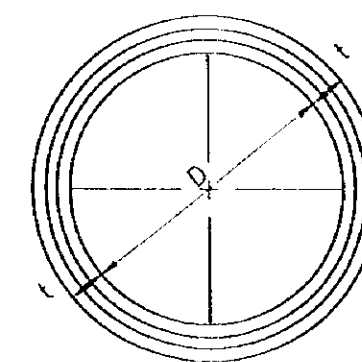


LONGITUDINAL SECTION



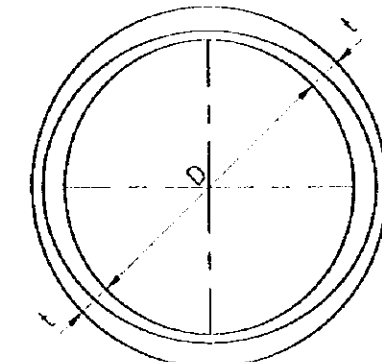
ONE LINE OF CIRCULAR
REINFORCEMENT

SECTION (B)



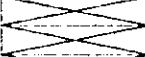



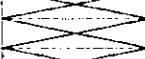
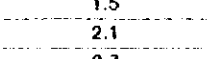
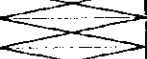
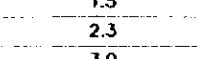


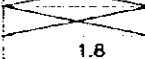
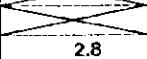
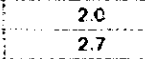
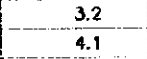
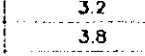
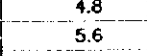
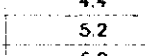
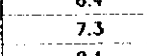
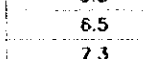
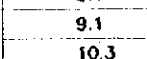
TWO LINE OF CIRCULAR
REINFORCEMENT

SECTION (C)



ONE LINE OF ELLIPTICAL
REINFORCEMENT

REINFORCED CONCRETE PIPE CULVERTS

INTERNAL DESIGNATED DIAMETER (MM)	WALL THICKNESS (MM)	REINFORCEMENT, CM/M OF PIPE					
		CLASS II R C P			CLASS III R C P		
		D-LOAD TO PRODUCE ϕ 0.3 mm CRACK 50.0			D-LOAD TO PRODUCE ϕ 0.3 mm CRACK 65.0		
		D-LOAD TO PRODUCE THE ULTIMATE LOAD 75.0			D-LOAD TO PRODUCE THE ULTIMATE LOAD 100.0		
		CONCRETE STRENGTH 27.6 MPa			CONCRETE STRENGTH 27.6 MPa		
CIRCULAR REINFORCEMENT			ELLIPTICAL REINFORCEMENT	CIRCULAR REINFORCEMENT		ELLIPTICAL REINFORCEMENT	
INNER CAGE	OUTER CAGE	INNER CAGE		OUTER CAGE			
300	44	1.5			1.5		
375	47	1.5			1.5		
450	50	1.5		1.5	1.5		1.5
500	57	2.5		2.1	2.1		2.3
600	63	2.8		2.3	2.3		3.0
675	66	3.2		2.8	2.8		3.4
750	69	3.2		3.0	3.0		3.8
825	72	3.4		3.2	3.2		4.2
900	75	3.0	1.8	3.2	4.4	2.8	4.7
1000	88	3.4	2.0	3.8	5.3	3.2	5.9
1200	100	4.5	2.7	4.9	6.8	4.1	7.5
1350	113	5.3	3.2	5.9	8.0	4.8	8.9
1500	125	6.4	3.8	7.0	9.3	5.6	10.4
1650	138	7.4	4.4	8.3	10.8	6.4	11.6
1800	150	8.7	5.2	9.5	12.1	7.3	13.3
1950	163	9.7	5.8	10.8	13.3	8.1	15.0
2000	175	10.8	6.5	12.1	15.2	9.1	16.9
2250	188	12.1	7.3	13.3	17.1	10.3	19.1
2400	200	13.1	7.9	14.8	19.7	11.8	21.8

NOTE : FOR CLASS III R.C.P CONCRETE STRENGTH = 34.5 MPa
WHEN $D \geq 1950$ MM

R C P CULVERT CLASS	INSIDE DIAMETER D (mm)	WALL THICKNESS T (mm)	PIPE END DETAILS (cm)			
			a	b	c	d
CLASS II & III	300	44	17	7	20	30
	375	47	18	7	22	30
	450	50	19	8	23	30
	500	57	22	10	25	40
	600	63	24	10	29	40
	675	66	26	10	30	45
	750	69	28	10	31	45
	825	72	28	13	31	45
	900	75	29	15	31	45
	1000	88	33	15	38	45
	1200	100	40	20	45	50
	1350	113	44	20	49	55
	1500	125	48	25	52	60
	1650	138	53	25	60	60
	1800	150	57	30	63	65
	1950	163	62	35	66	65
	2000	175	66	40	69	70
	2250	188	71	45	72	70
	2400	200	78	50	74	75

GENERAL NOTES:

Specifications :

AASHTO DESIGNATION : M 170 M-93
ASTM DESIGNATION : C 78 W-90a

- ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE INDICATED
- REINFORCED CONCRETE PIPE CULVERT.
 - CONTENT USED FOR CONCRETE MIX SHALL BE LESS THAN 335 PER CUBIC METER OF CONCRETE
 - REINFORCEMENT SHALL CONSIST OF WIRE CONFORMING TO AASHTO M32 OR M225, OR OF GRADE 300 STEEL CONFORMING TO AASHTO M31 M.
 - WHERE LINE OF CIRCULAR REINFORCEMENT IS USED, IT SHALL BE PLACED FROM 35 TO 50 PERCENT OF THE WALL THICKNESS FROM THE INNER SURFACE OF THE PIPE
 - IN PIPE HAVING TWO LINES OF CIRCULAR REINFORCEMENT, EACH LINE SHALL BE SO PLACED THAT THE PROTECTIVE COVERING OF CONCRETE OVER THE CIRCUMFERENTIAL REINFORCEMENT IN THE WALL OF THE PIPE SHALL BE 25MM
 - IN PIPE HAVING ELLIPTICAL REINFORCEMENT WITH WALL THICKNESSES 63MM OR GREATER, REINFORCEMENT IN THE WALL OF THE PIPE SHALL BE SO PLACED THAT THE PROTECTIVE COVERING OF CONCRETE OVER THE CIRCUMFERENTIAL REINFORCEMENT SHALL BE 25MM FROM THE INNER SURFACE OF THE PIPE AT THE VERTICAL DIAMETER AND 25mm FROM THE OUTER SURFACE OF THE PIPE AT THE HORIZONTAL DIAMETER, IN PIPE HAVING ELLIPTICAL REINFORCEMENT WITH WALL THICKNESS LESS THAN 63mm, THE PROTECTIVE COVERING SHALL BE 19mm AT THE VERTICAL AND HORIZONTAL DIAMETERS.
 - LONGITUDINAL REINFORCEMENT SPACING FOR PIPE SIZE 500MM ϕ OR SMALLER IN DIAMETER SHALL BE A MINIMUM OF 4 - 4mm ϕ BARS OR 8 - 4mm ϕ BARS FOR PIPES 600mm OR LARGER.
- CULVERT JOINTS SHALL BE MOTARED AS SHOWN ON THE DRAWING WITH CEMENT MORTAR (1:2 BY VOLUME).
- CULVERT LENGTH (L) SHALL BE 1000MM UNLESS OTHERWISE SPECIFIED.
- REINFORCED CONCRETE PIPE CULVERT CLASS II SHALL BE USED UNDER ROADWAY PAVEMENT
- REINFORCED CONCRETE PIPE CULVERT CLASS II SHALL BE USED IN ANY PLACE OTHER THAN UNDER PAVEMENT.

DESIGN REQUIREMENTS OF REINFORCED CONCRETE PIPE CULVERTS

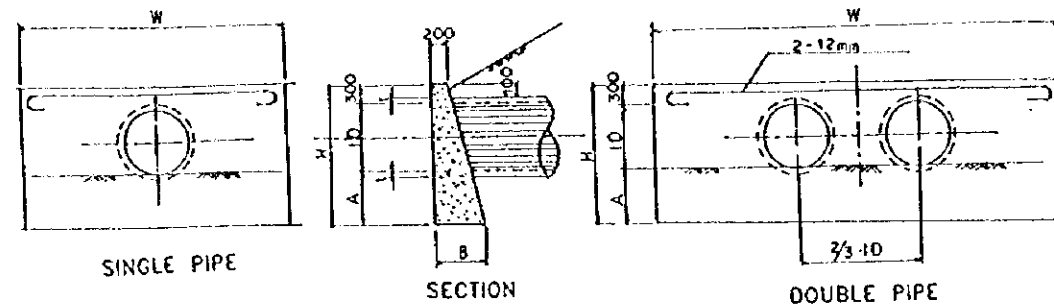
FEASIBILITY STUDY ON ROAD IMPROVEMENT AND REHABILITATION IN GRENADA

SCALE:

Side Ditch

DRAWING NO.

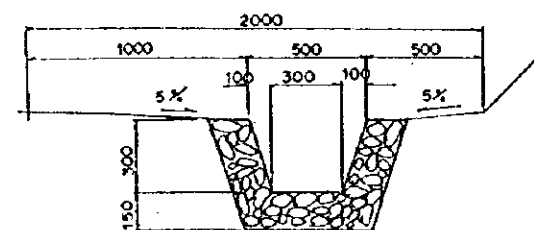
D-3



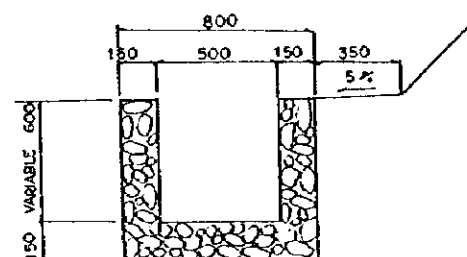
STRAIGHT TYPE HEADWALL
TYPE "HW (C)-A"

TABLE A (ONE STRAIGHT TYPE HEADWALL)

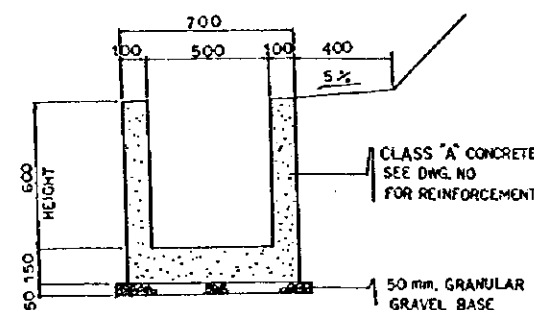
DIAMETER ID	THICKNESS OF PIPE (mm)		DIMENSION (mm)			TYPE	
	MACHINE MADE MIN THK. (mm)	HAND MADE MIN THK. (mm)	A	B	H	SINGLE W (mm)	DOUBLE W (mm)
460	30	76	310	350	1070	1800	2600
610	44	90	410	330	1320	2400	3500
760	76	102	510	530	1570	3000	4400
910	86	114	610	600	1820	3600	5200
1220	108	—	810	810	2330	4800	6900



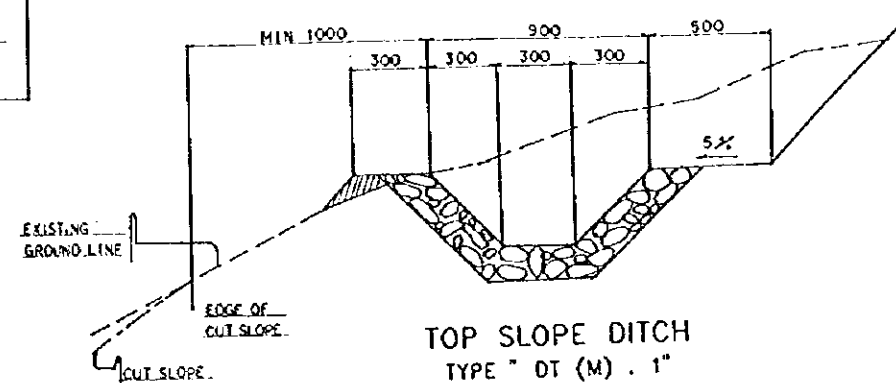
BERM DITCH
TYPE "DS (M)-H"



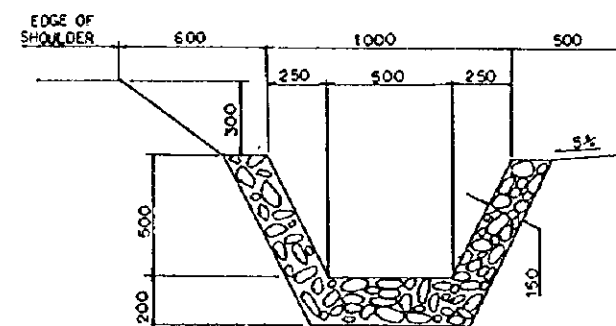
SIDE DITCH
TYPE "DS (M)-C"



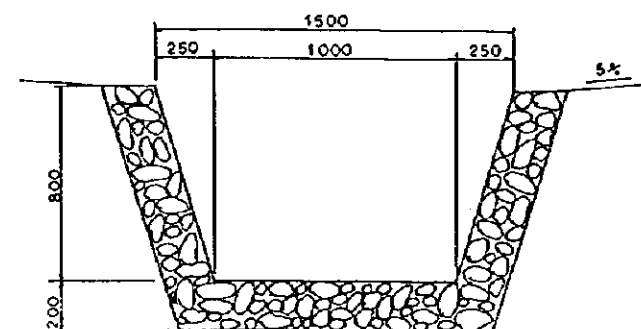
SIDE DITCH
TYPE "DS (C)-"



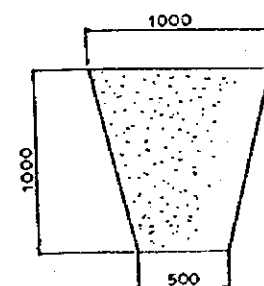
TOP SLOPE DITCH
TYPE "DT (M) - I"



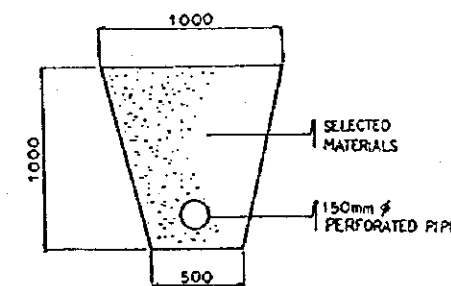
SIDE DITCH
TYPE "DS (M)-E"



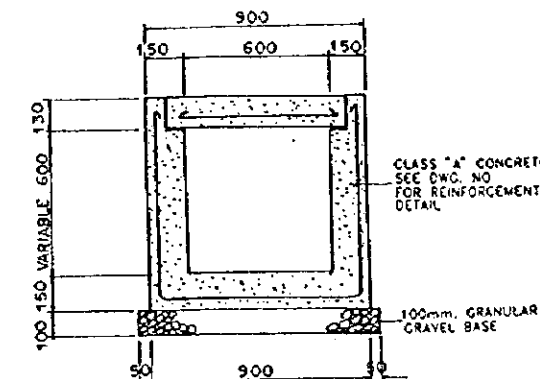
SIDE DITCH
TYPE "DS (M)-F"



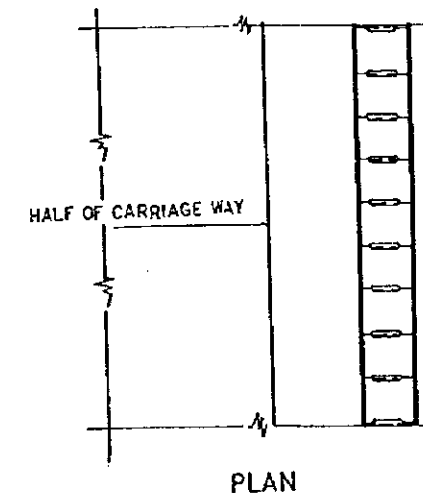
SUB SURFACE DRAIN
TYPE "DSS (G)-A"



SUB SURFACE DRAIN
TYPE "DSS (G/P)-B"

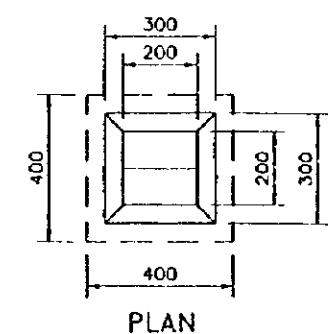
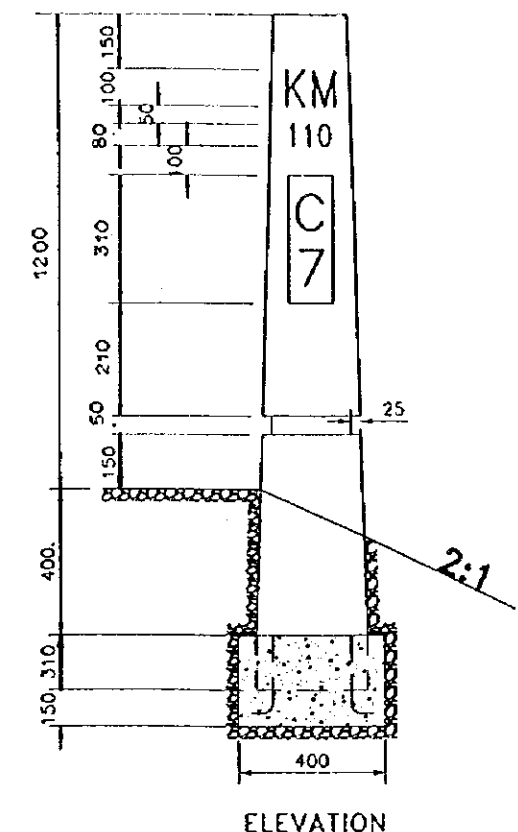


SIDE DITCH
TYPE "DS (C) - A"



PLAN

TYPICAL ROADWAY SECTION WITH COVERED DITCH
REINFORCED CONCRETE DITCH WITH COVER
TYPE "DS(C) - A"



KILOMETER POST

5. BRIDGES

FEASIBILITY STUDY ON ROAD IMPROVEMENT AND REHABILITATION
IN GRENADA

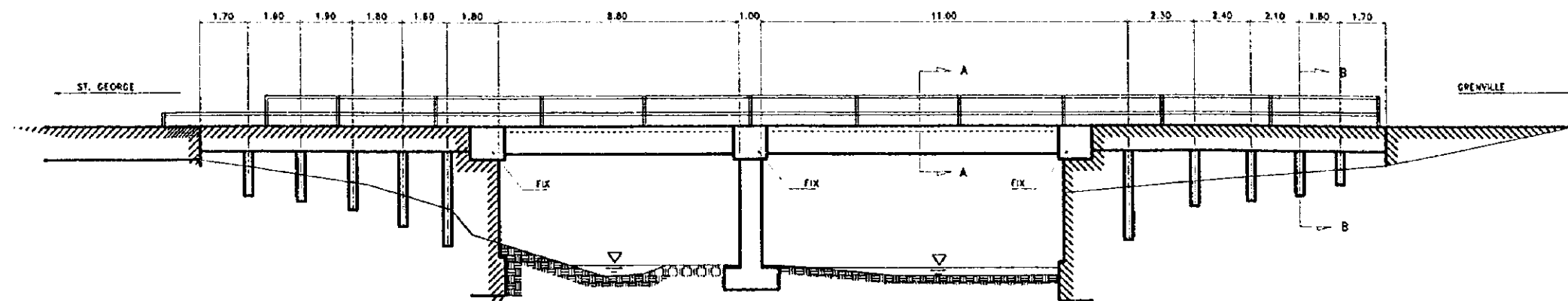
SCALE:

1:100

BEAULIEU BRIDGE

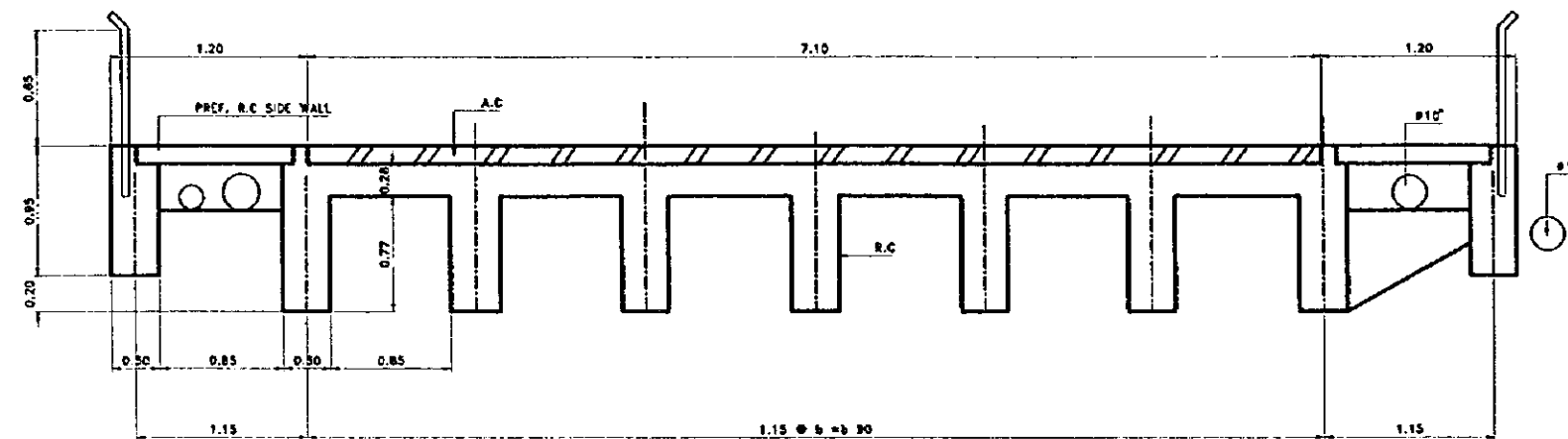
DRAWING NO.

B-1



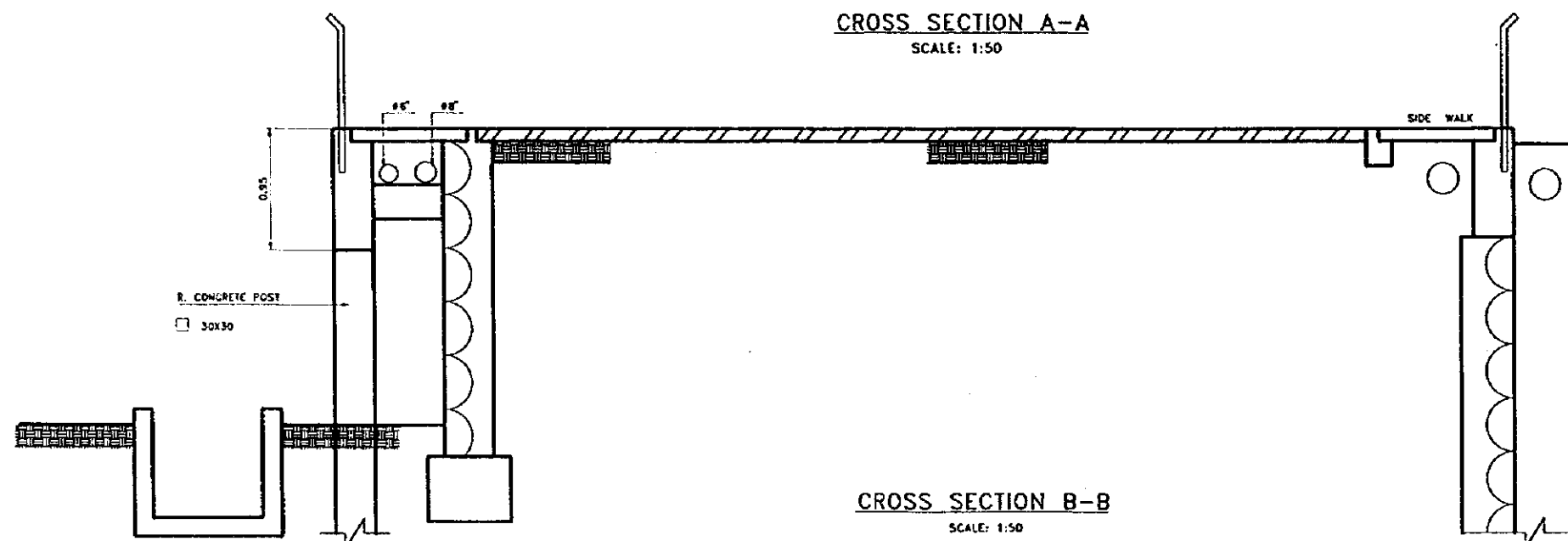
LONGITUDINAL SECTION

SCALE: 1:200



CROSS SECTION A-A

SCALE: 1:50



CROSS SECTION B-B

SCALE: 1:50

FEASIBILITY STUDY ON ROAD IMPROVEMENT AND REHABILITATION IN GRENADA

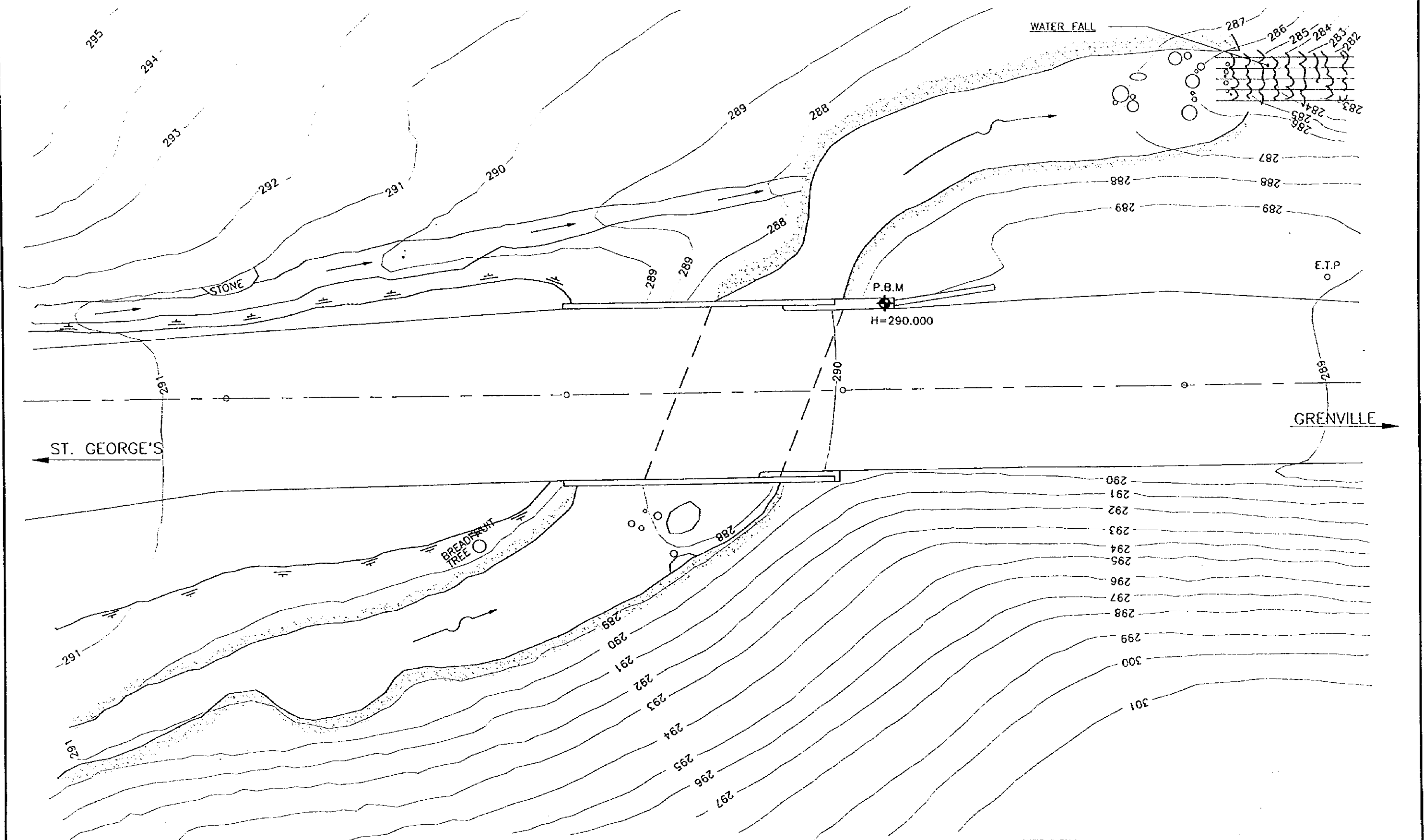
SCALE:

1:100

ST. MARGARET BRIDGE

DRAWING NO.

B-2



BIRCH GROVE BRIDGE

ELEVATION SCALE 1:200

FEASIBILITY STUDY ON ROAD IMPROVEMENT AND REHABILITATION
IN GRENADA

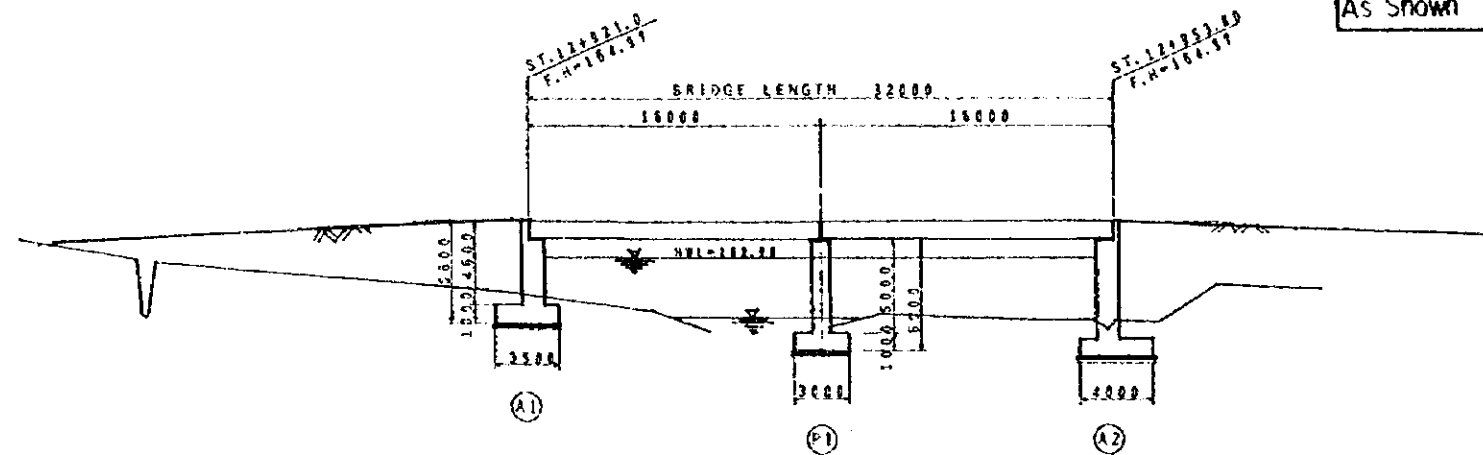
SCALE:

As Shown

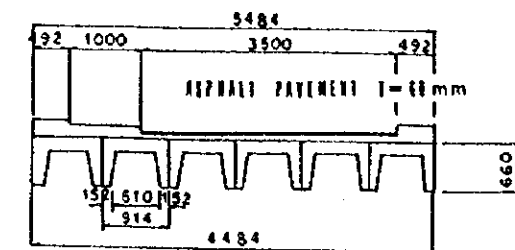
Birch Grove Bridge

DRAWING NO.

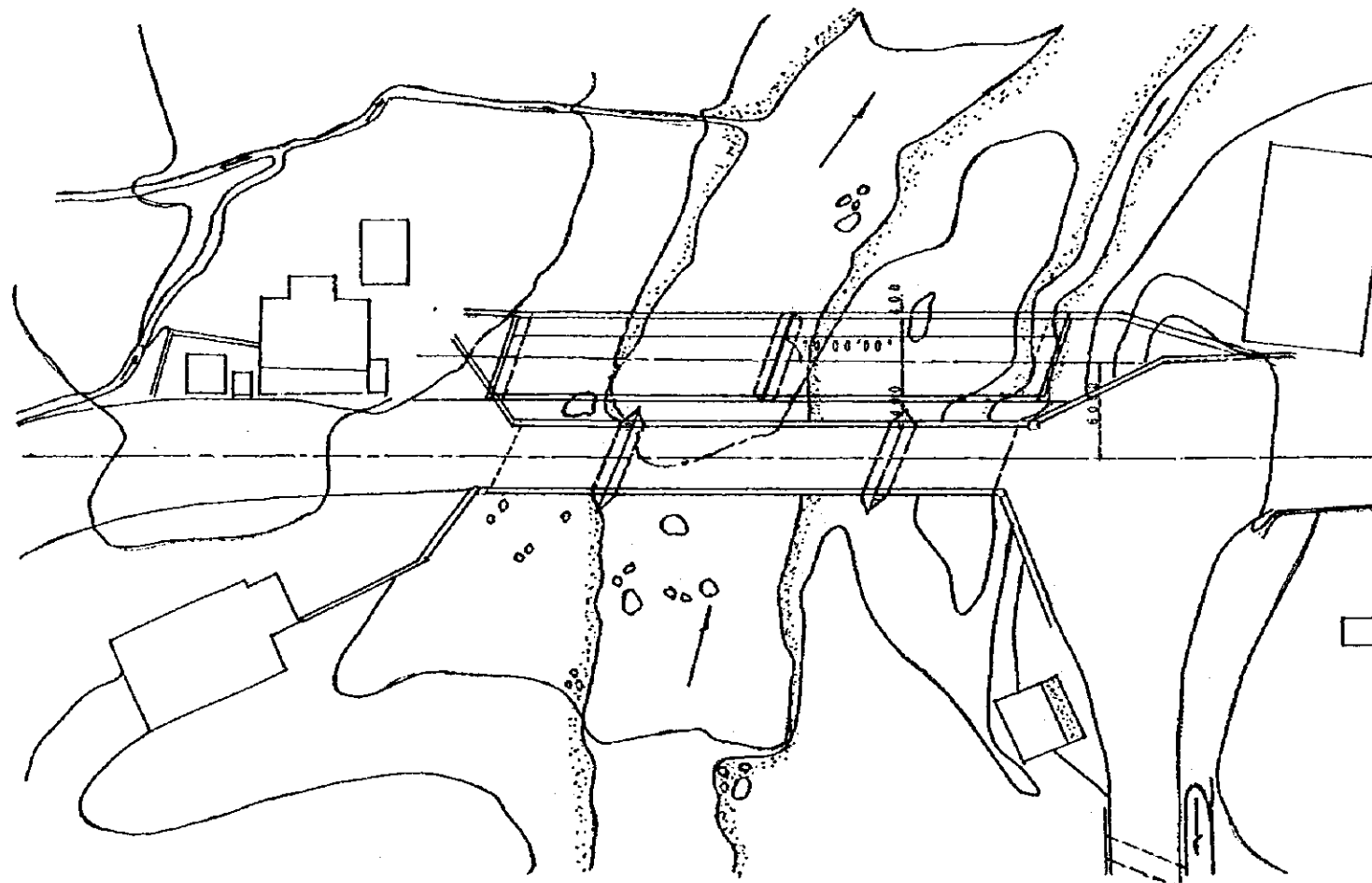
B-3



CROSS SECTION S= 1:50

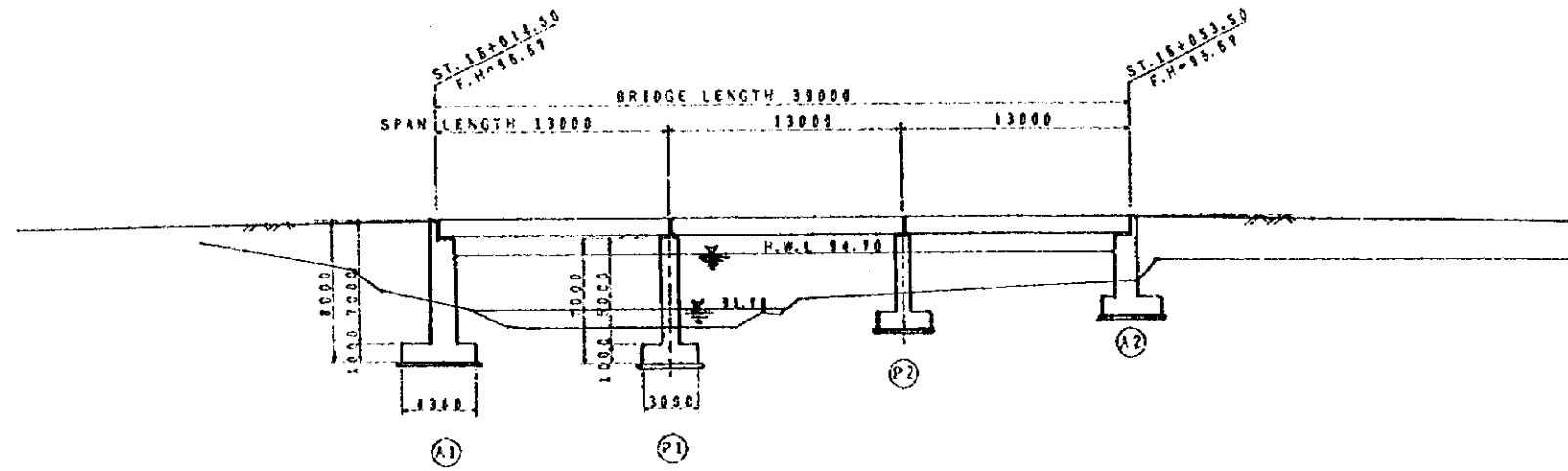


PLAN S= 1:200

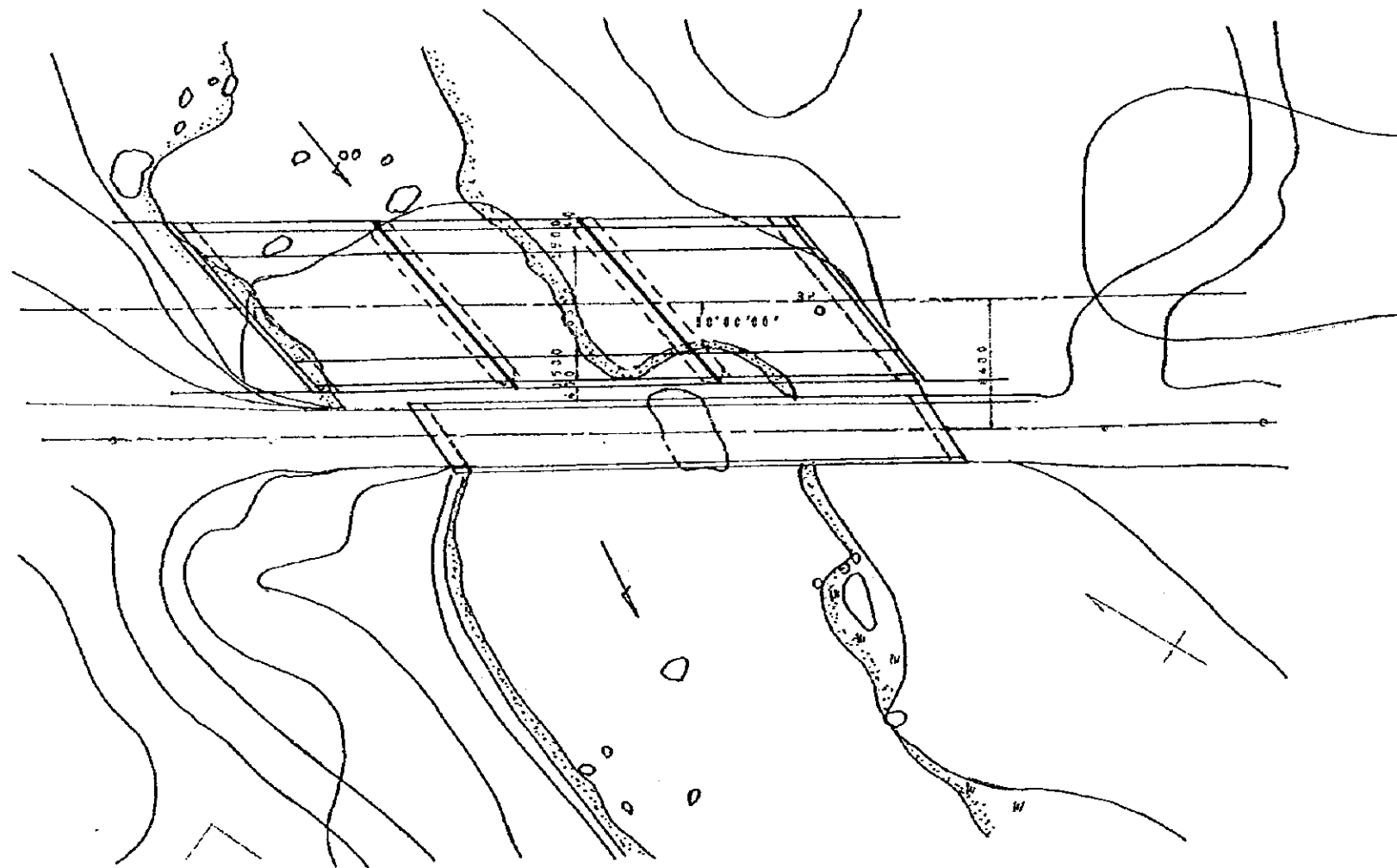


BALTHAZAR BRIDGE

ELEVATION $\frac{1}{200}$



PLAN $\frac{1}{200}$



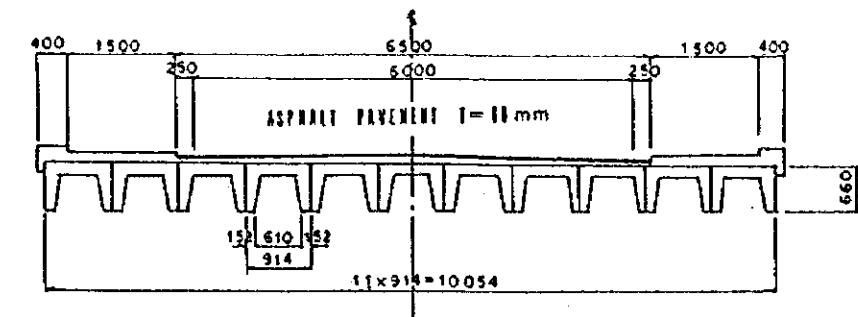
FEASIBILITY STUDY ON ROAD IMPROVEMENT AND REHABILITATION
IN GRENADA

SCALE:
As Shown

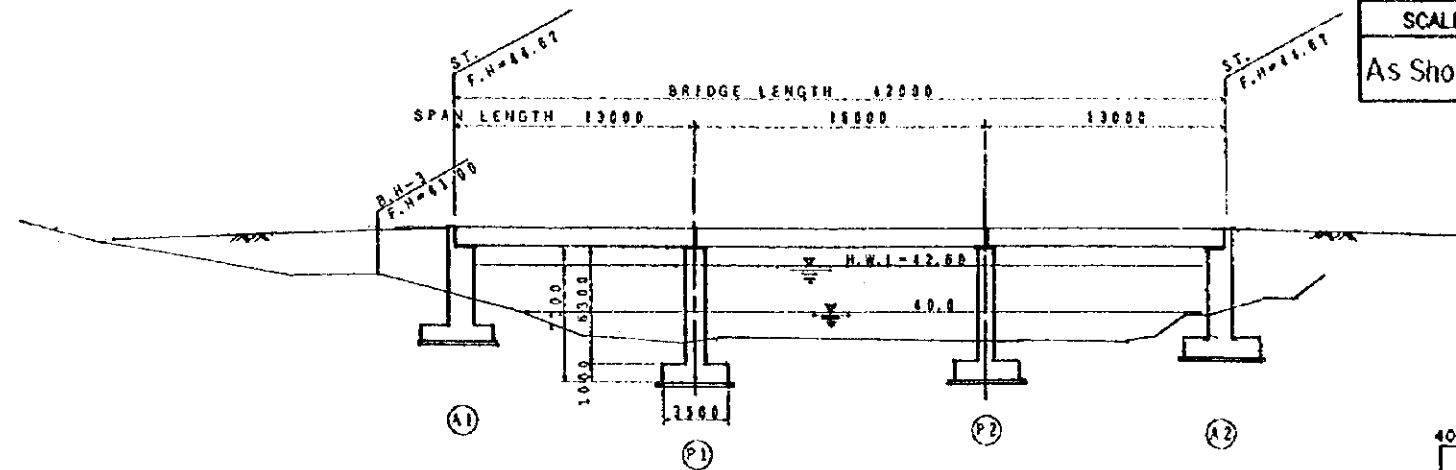
Balthazar Bridge

DRAWING NO.
B-4

CROSS SECTION $\frac{1}{50}$



ELEVATION §= 1:200



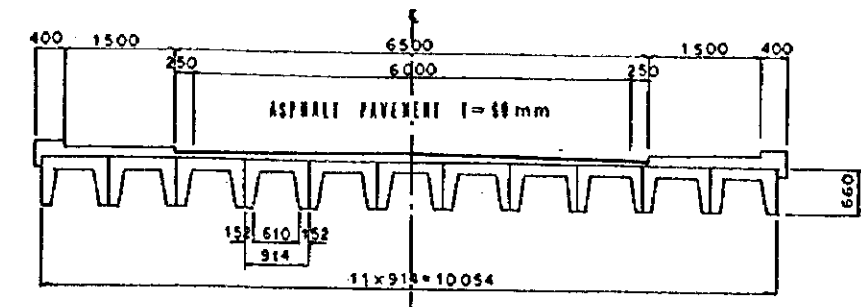
FEASIBILITY STUDY ON ROAD IMPROVEMENT AND REHABILITATION IN GRENADA

SCALE:
As Shown

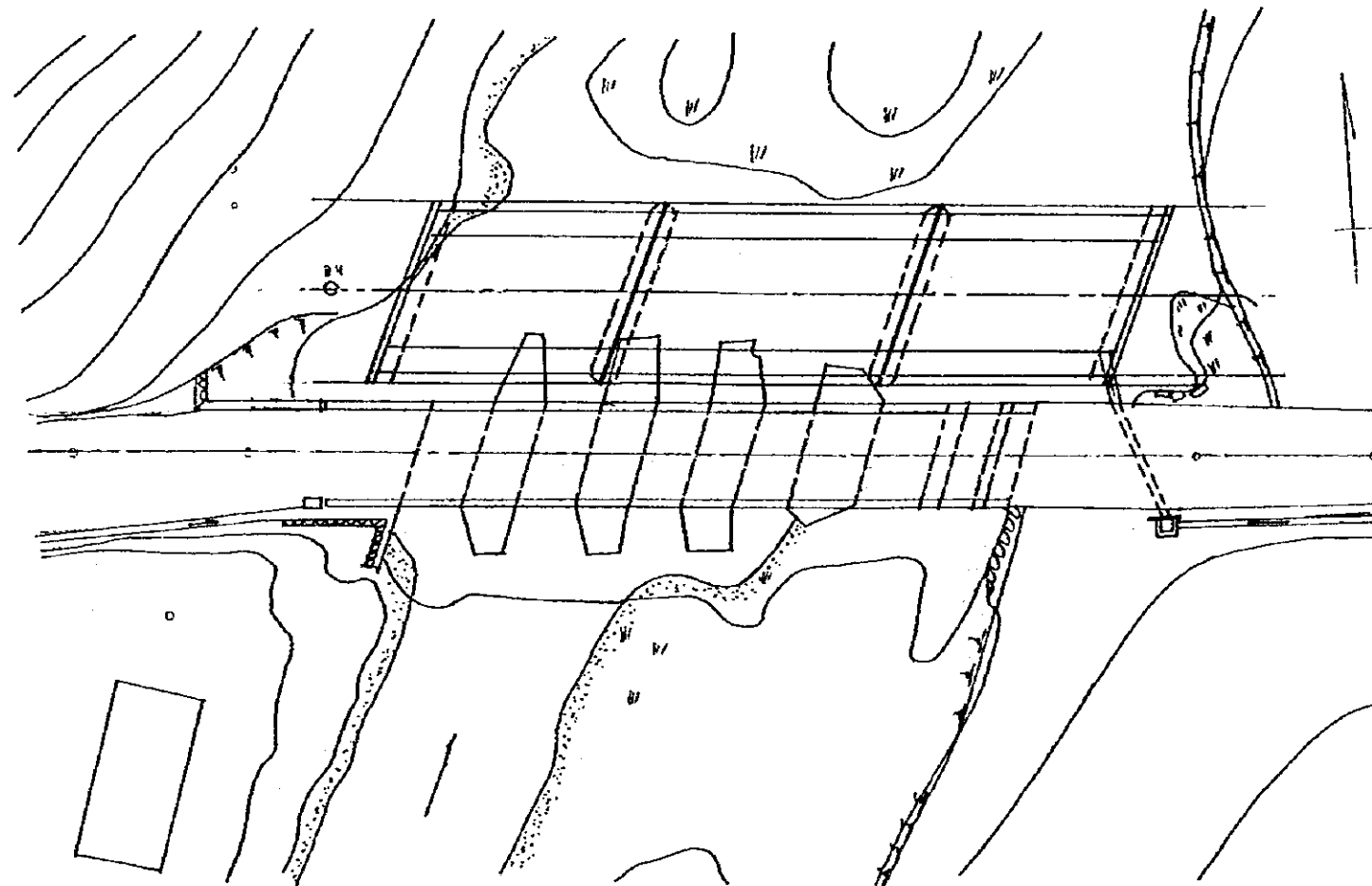
St. Cyr Greatriver Bridge

DRAWING NO.
B-5

CROSS SECTION §= 1:50



PLAN §= 1:200

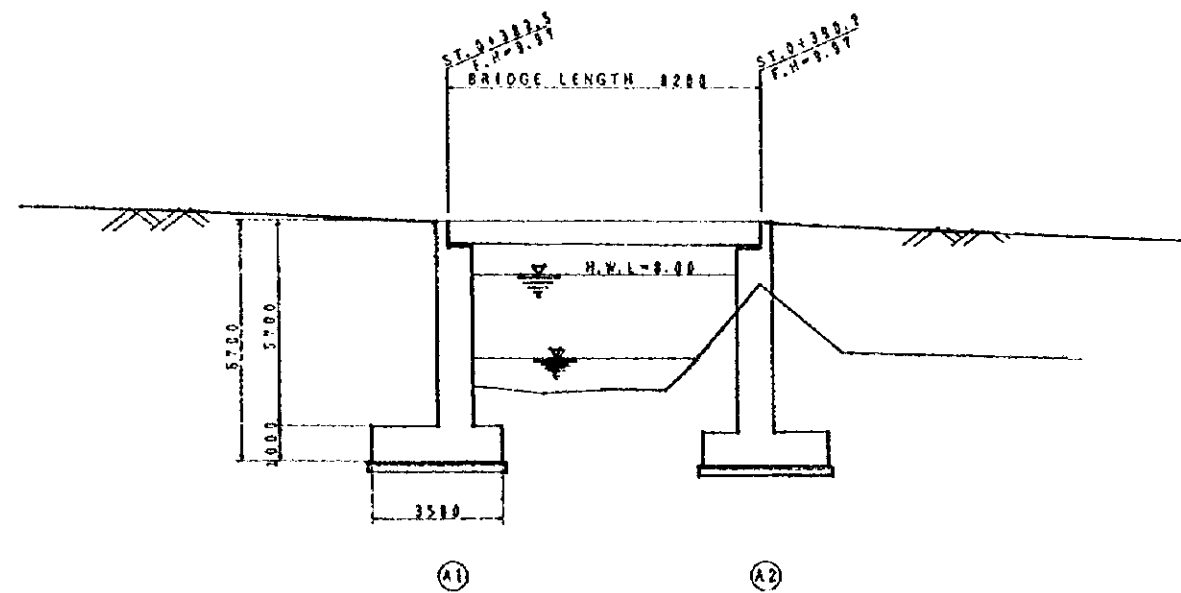


SCALE:	Vineyard Bridge	DRAWING NO.
As Shown		B-6

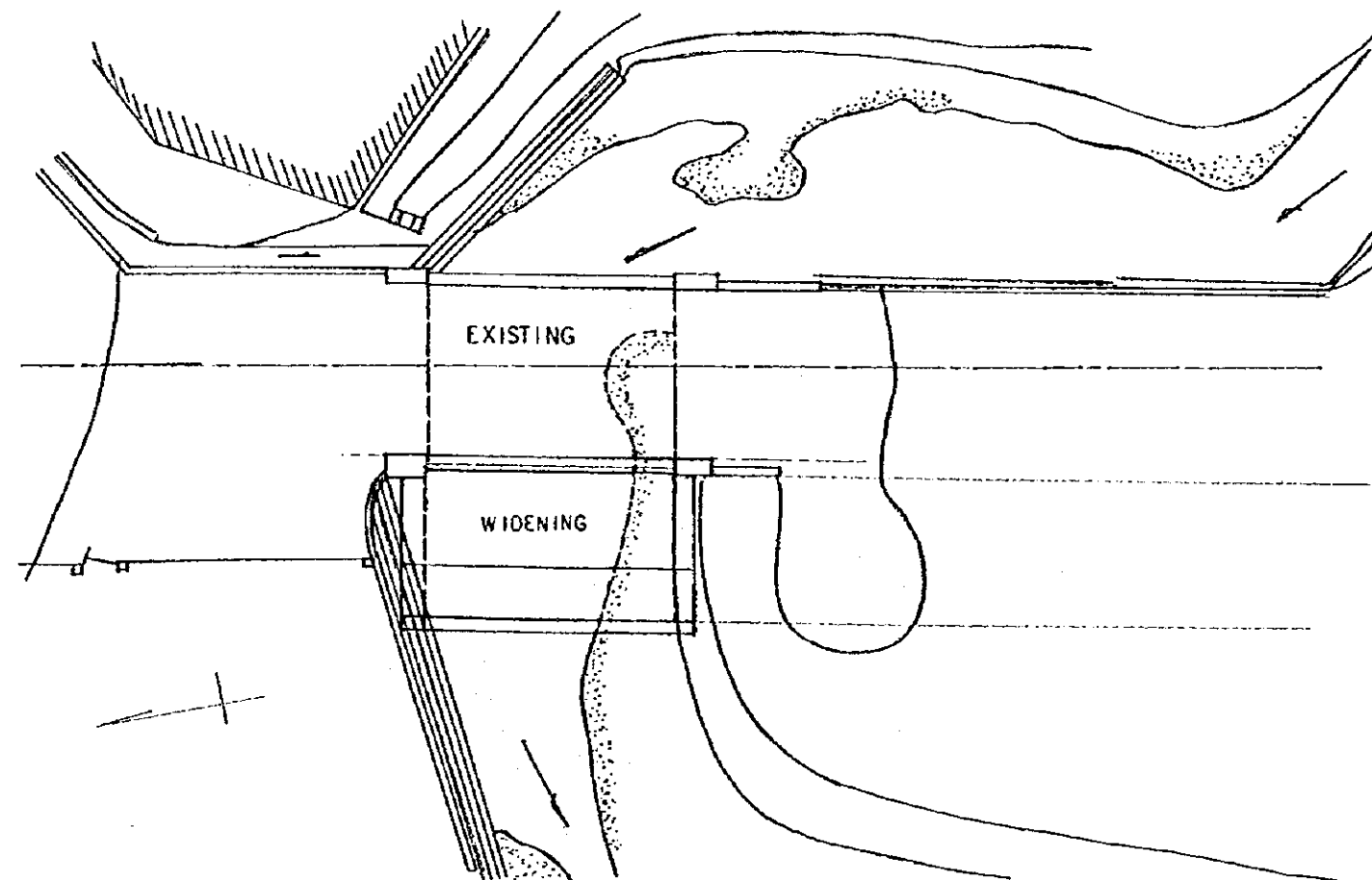
Diagram illustrating the cross-section of a road pavement structure. The structure consists of three main layers: Asphalt Pavement (T=60 mm), Concrete Base, and Concrete Slab. The total width of the road is 6600 mm, with 600 mm shoulders on each side. The central asphalt pavement width is 5400 mm (2700 mm on each side of the centerline). The concrete base and slab widths are 914 mm (510 mm on each side of the centerline). The diagram is labeled "a x 5/4 = 7312" at the bottom.

TEMPE BRIDGE

ELEVATION $\frac{1}{100}$



PLAN $\frac{1}{100}$



FEASIBILITY STUDY ON ROAD IMPROVEMENT AND REHABILITATION
IN GRENADA

SCALE:

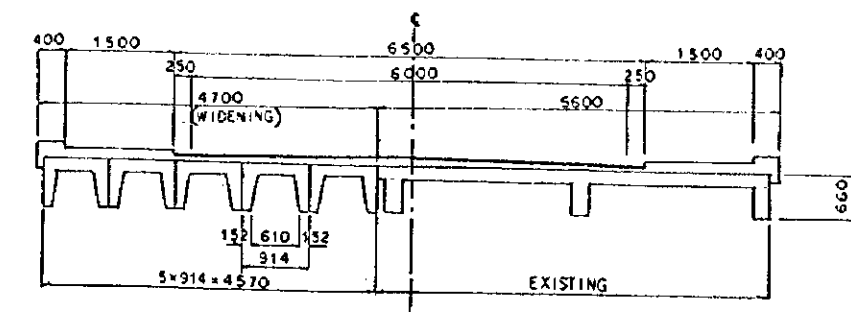
As Shown

Tempe Bridge

DRAWING NO.

B-7

CROSS SECTION $\frac{1}{50}$

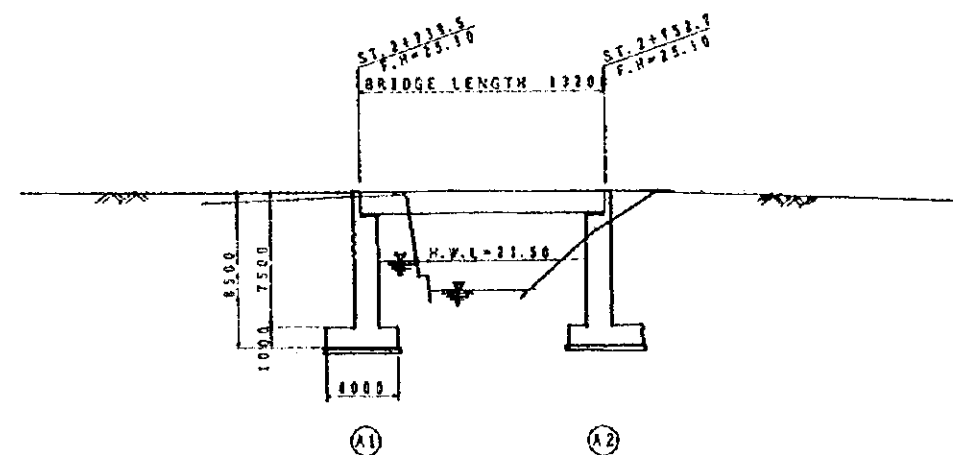


FEASIBILITY STUDY ON ROAD IMPROVEMENT AND REHABILITATION IN GRENADA

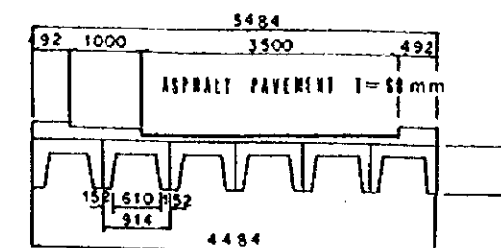
SCALE:
As Shown

Dunfermiline Bridge

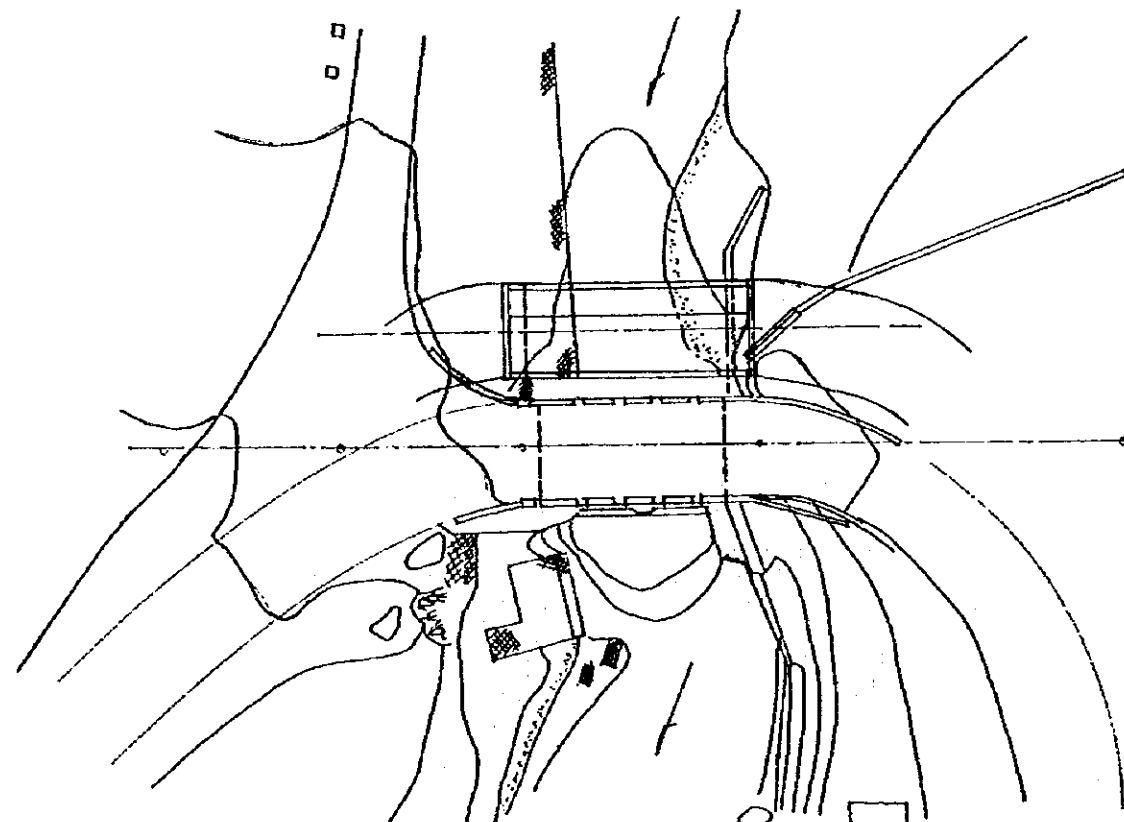
DRAWING NO.
B-8



CROSS SECTION $\S = 1:50$

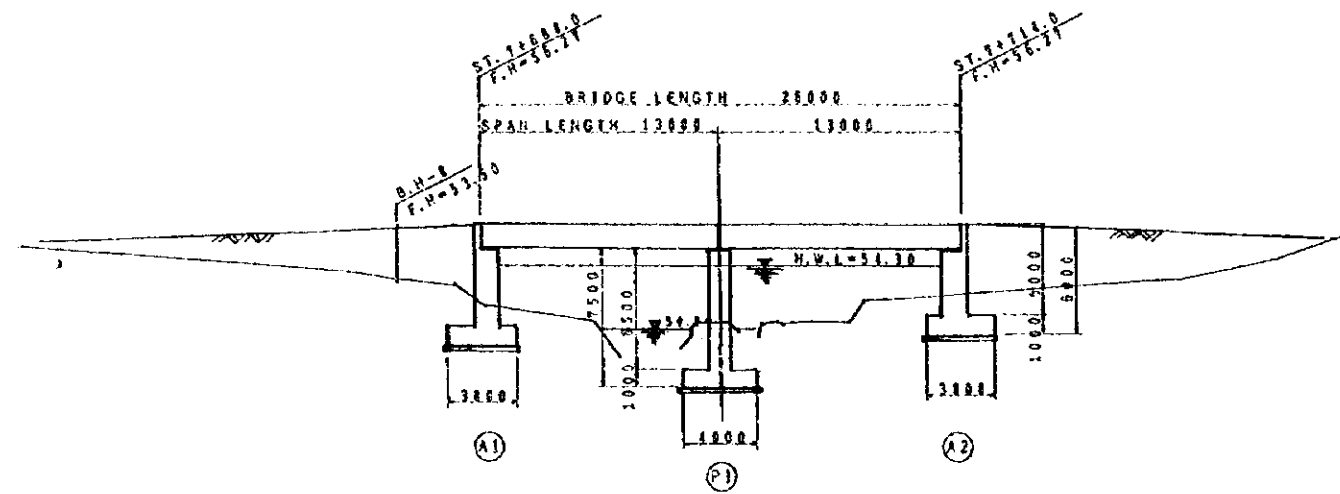


PLAN $S = 1:200$

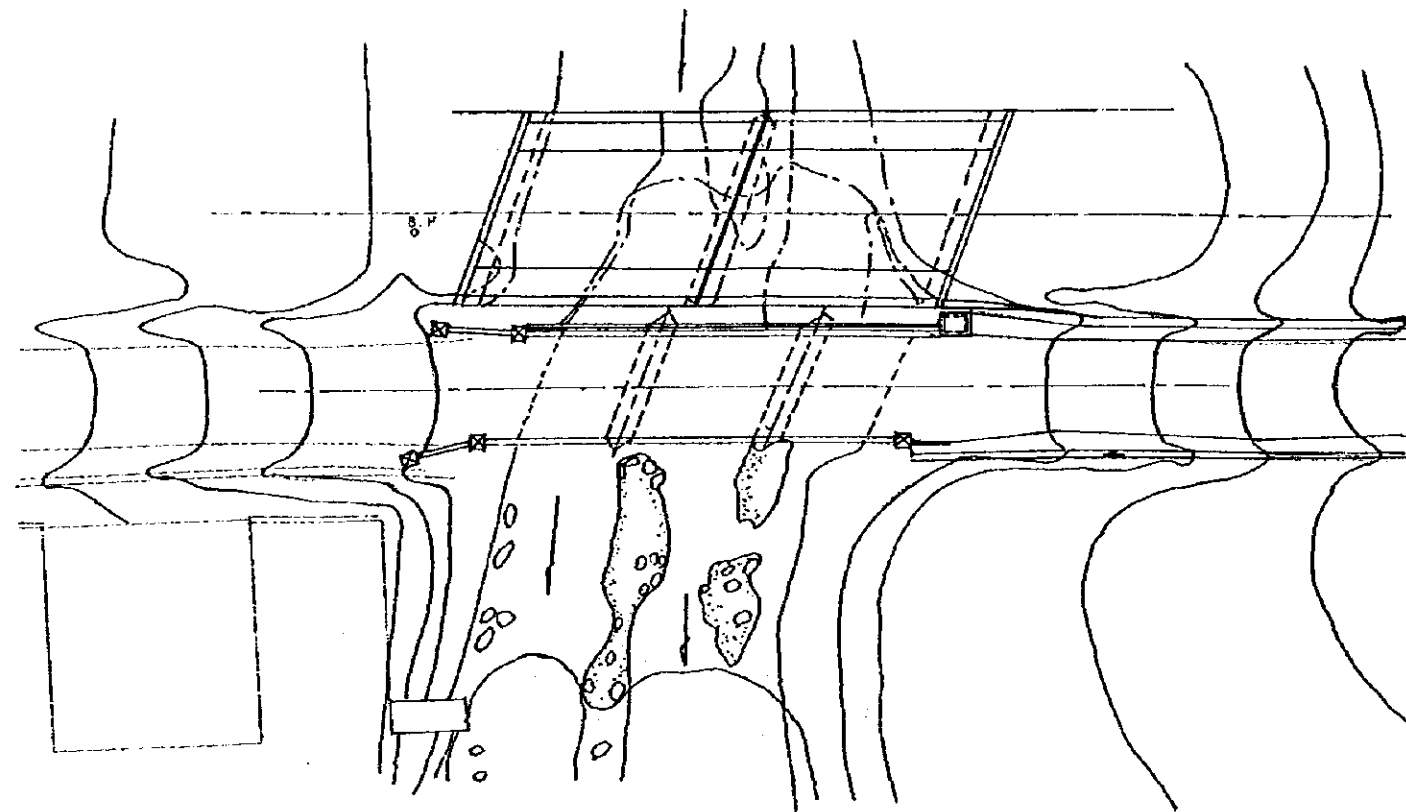


POINTE FIELD BRIDGE

ELEVATION $\frac{1}{200}$



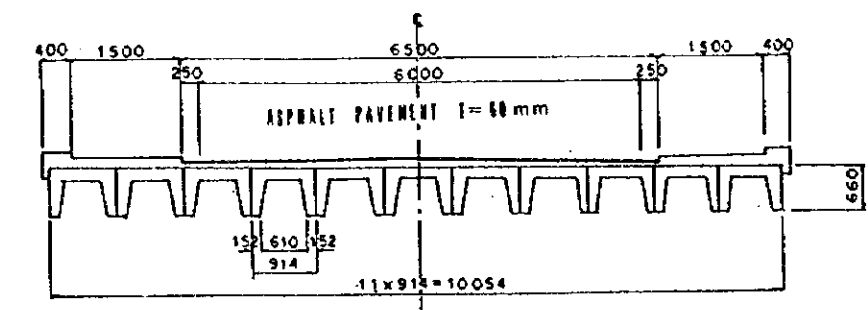
PLAN $\frac{1}{200}$



FEASIBILITY STUDY ON ROAD IMPROVEMENT AND REHABILITATION IN GRENADA

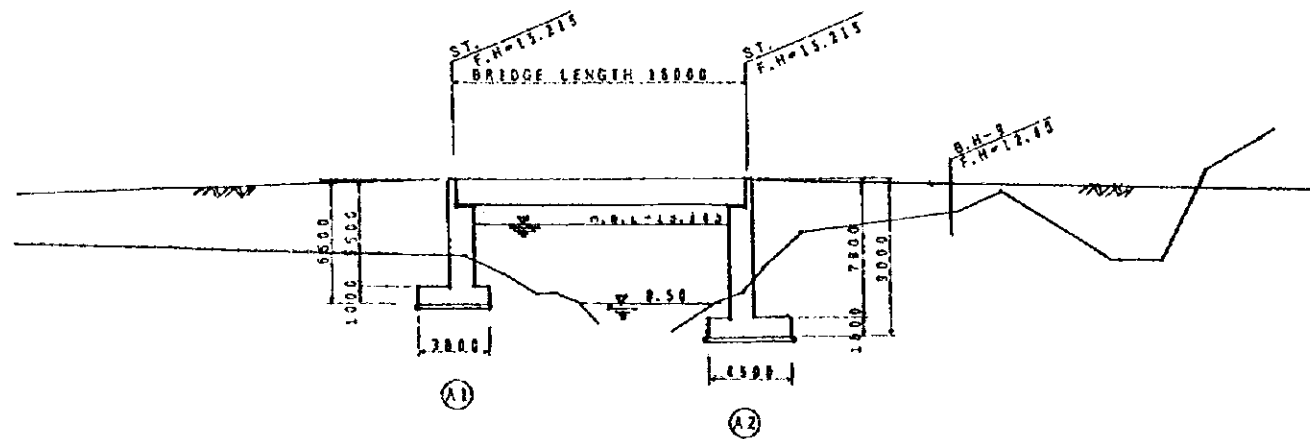
SCALE:		DRAWING NO.
As Shown	Pointe Field Bridge	B-9

CROSS SECTION $\frac{1}{50}$

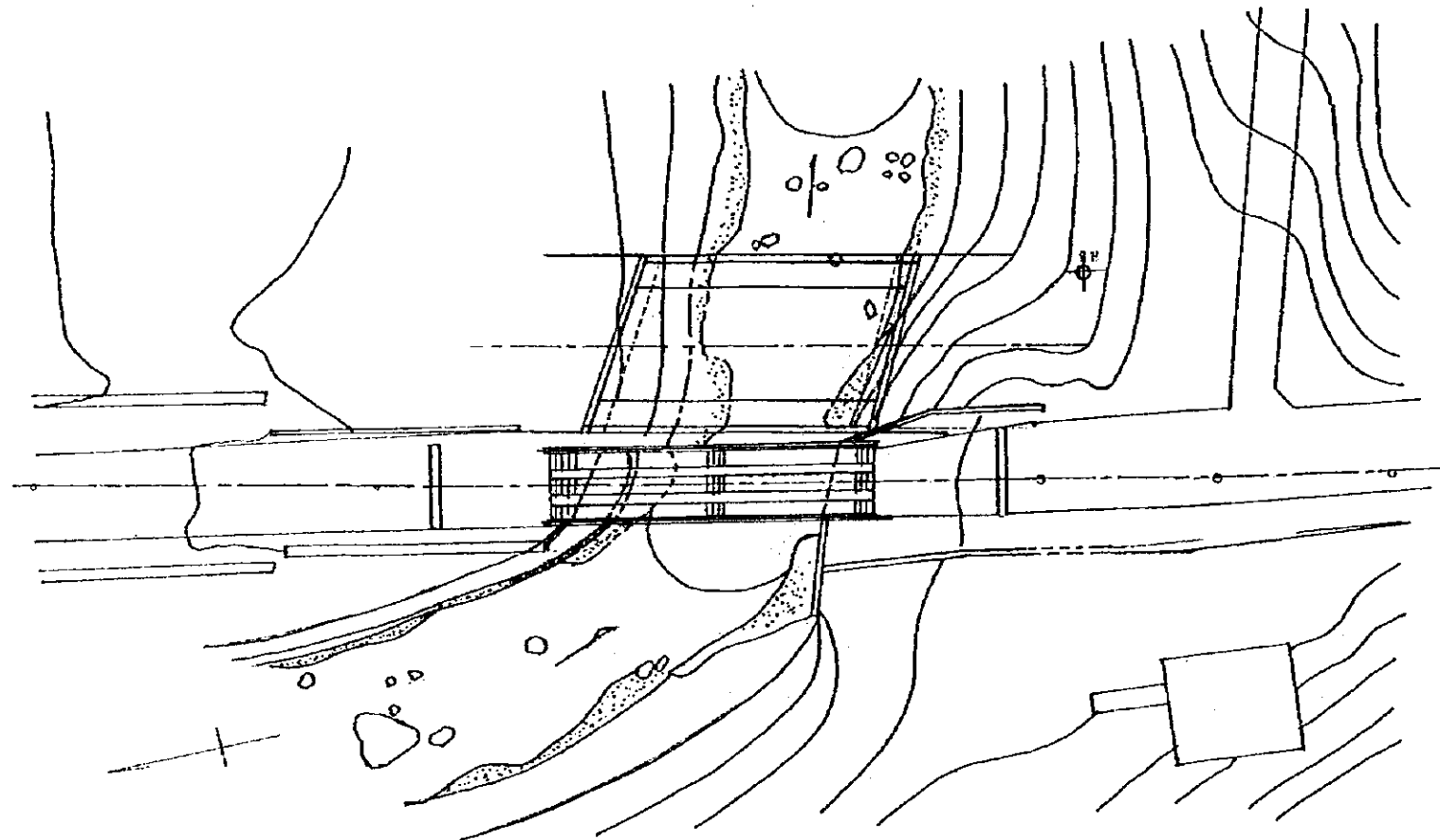


MADEYS BRIDGE

ELEVATION $\frac{1}{200}$



PLAN $\frac{1}{200}$



FEASIBILITY STUDY ON ROAD IMPROVEMENT AND REHABILITATION
IN GRENADA

SCALE:

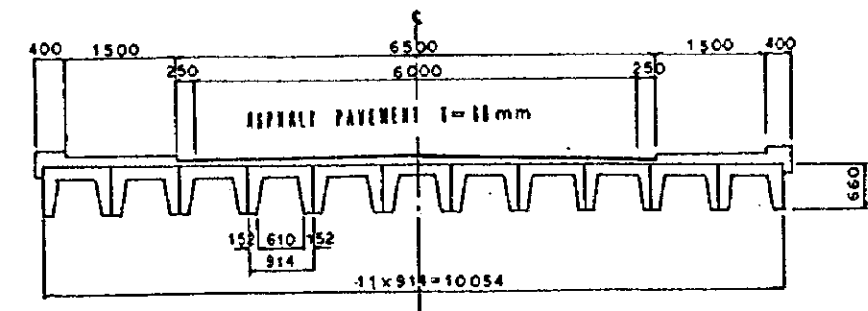
As Shown

Madeys Bridge

DRAWING NO.

B-10

CROSS SECTION $\frac{1}{50}$



SCALE:	Girder Layout	DRAWING NO.
Not to Scale		B-11

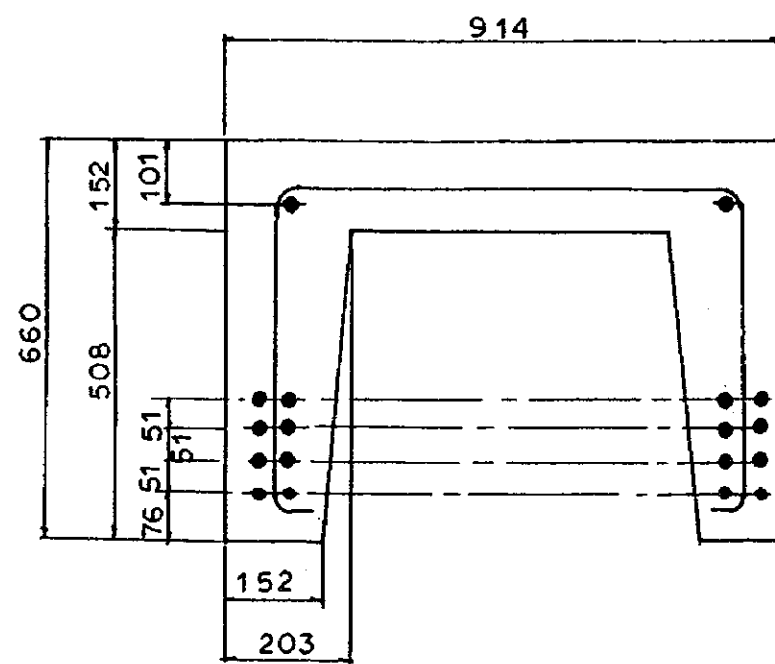


Diagram illustrating a detail of a diaphragm, showing a channel section with dimensions and labels:

- CHANNEL**: Indicated by a horizontal arrow at the top.
- Dimensions**:
 - Top flange width: 152
 - Web width: 101
 - Bottom flange width: 152
 - Bottom flange width (continued): 152
 - Bottom flange width (continued): 152
- Labels**:
 - STEEL PLATE FIXED FORM**: Points to the vertical web of the channel.
 - WELD PLATE**: Points to the horizontal plate at the bottom of the channel.
- DIAPHRAGM DETAIL**: Labeled at the bottom right.

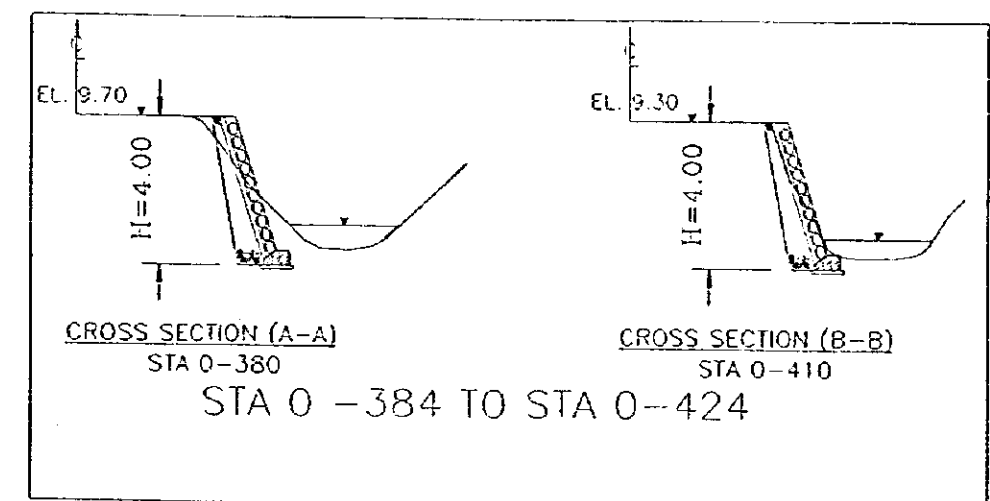
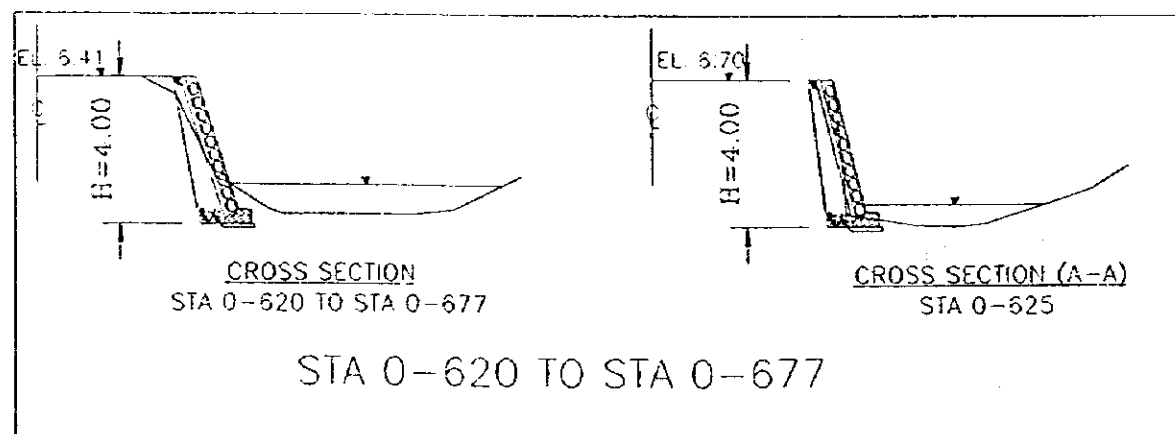
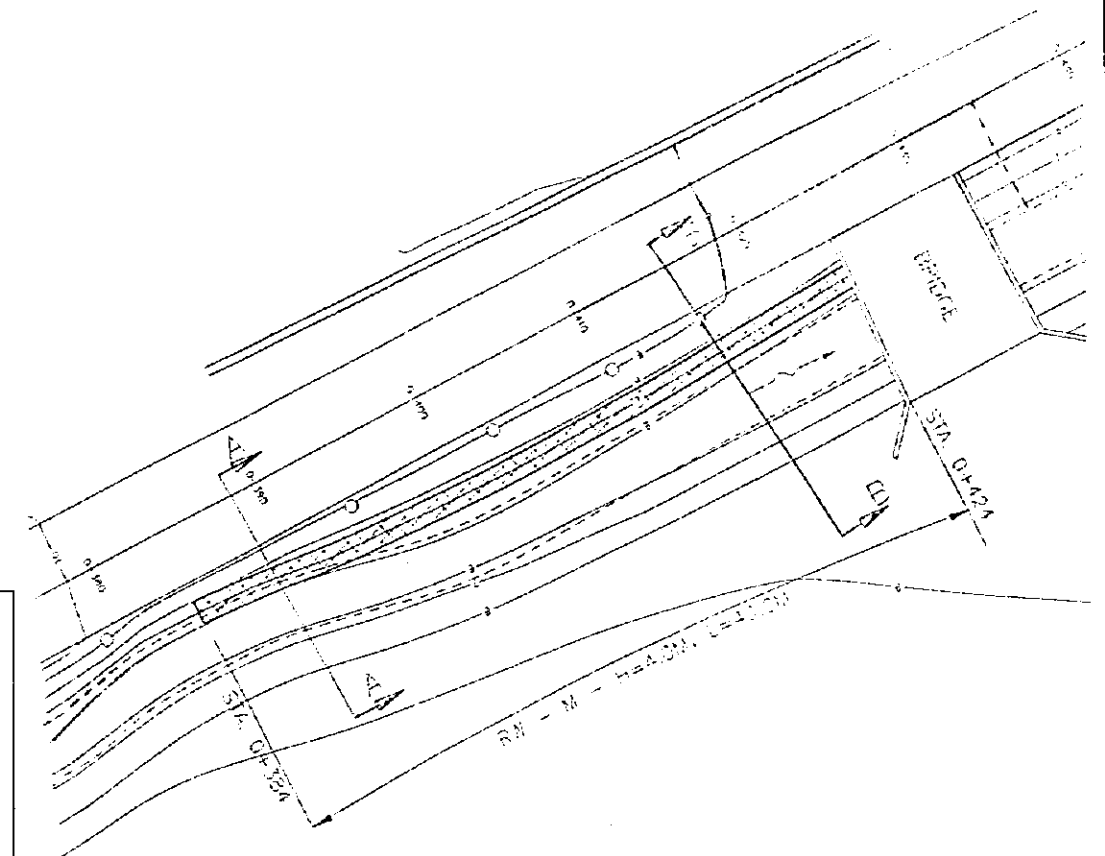
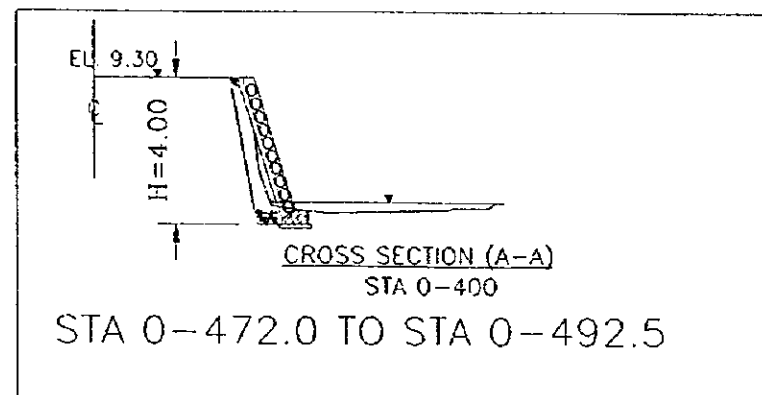
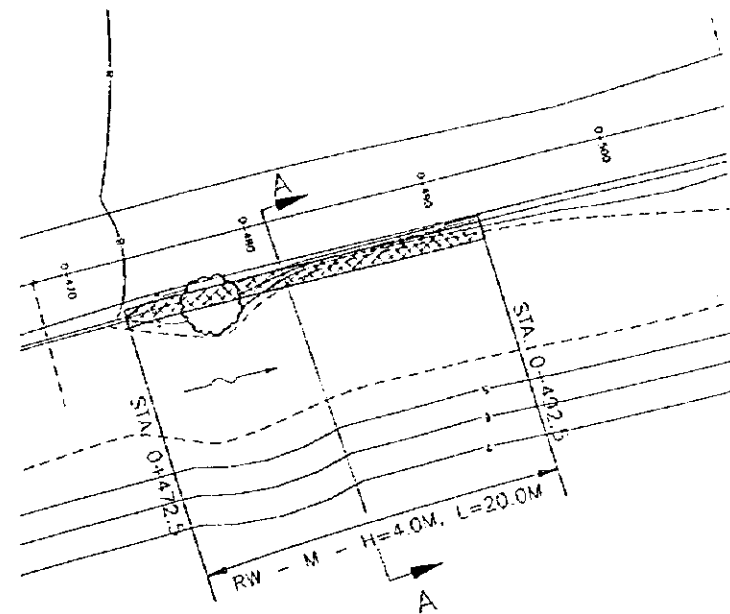
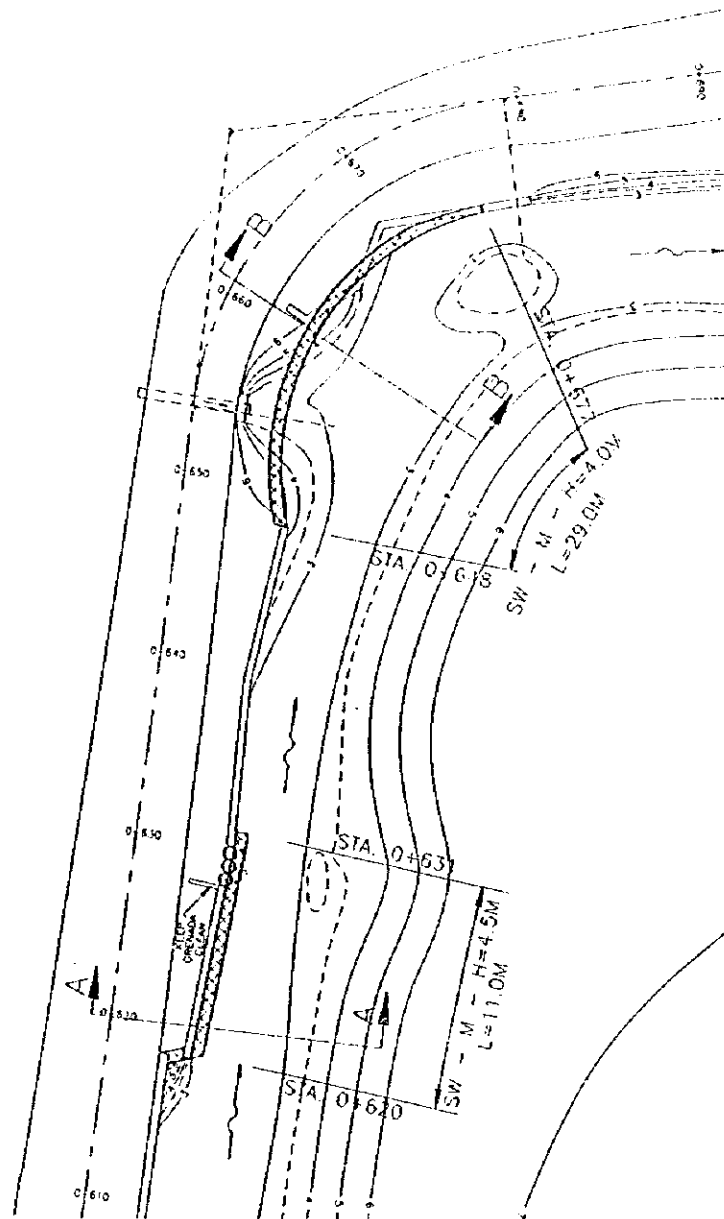
6. SLOPE PROTECTION

FEASIBILITY STUDY ON ROAD IMPROVEMENT AND REHABILITATION IN GRENADA

SCALE:
Not to Scale

Grand Etang Road (1)

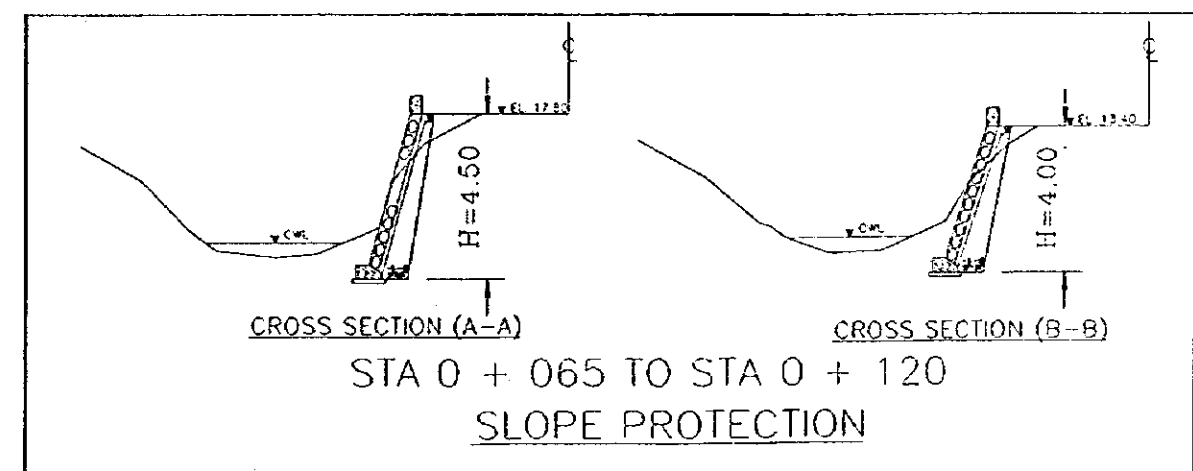
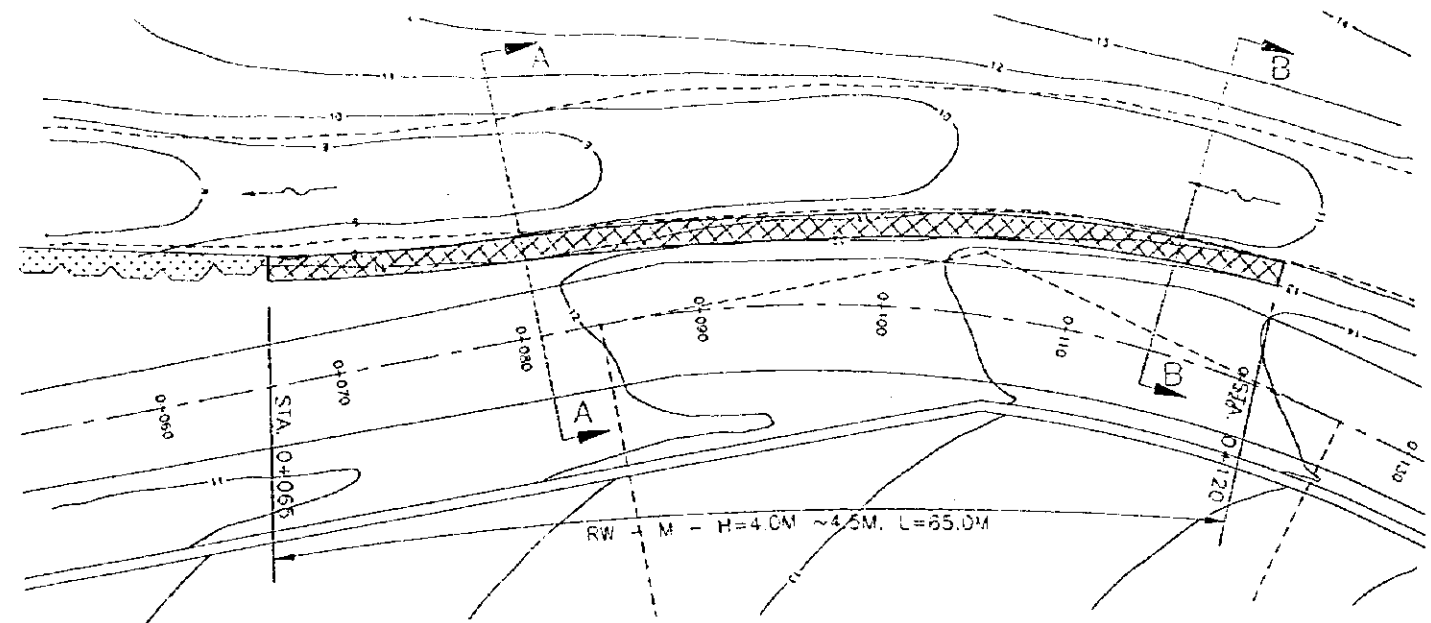
DRAWING NO.
SP-1



SCALE:
Not to Scale

Grand Etang Road (2)

SP-2

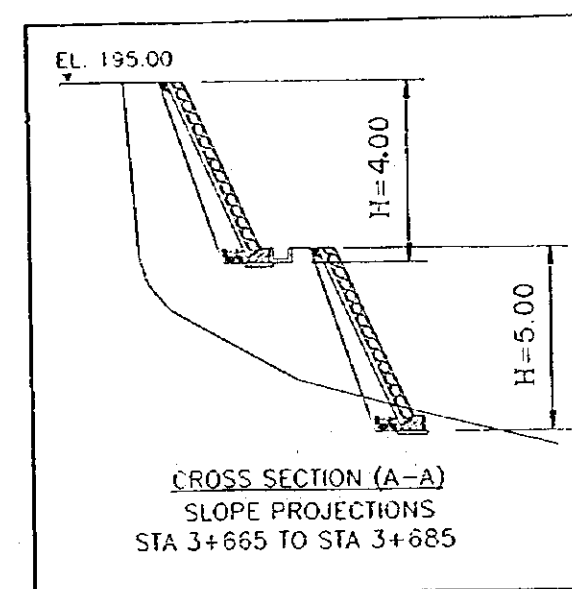
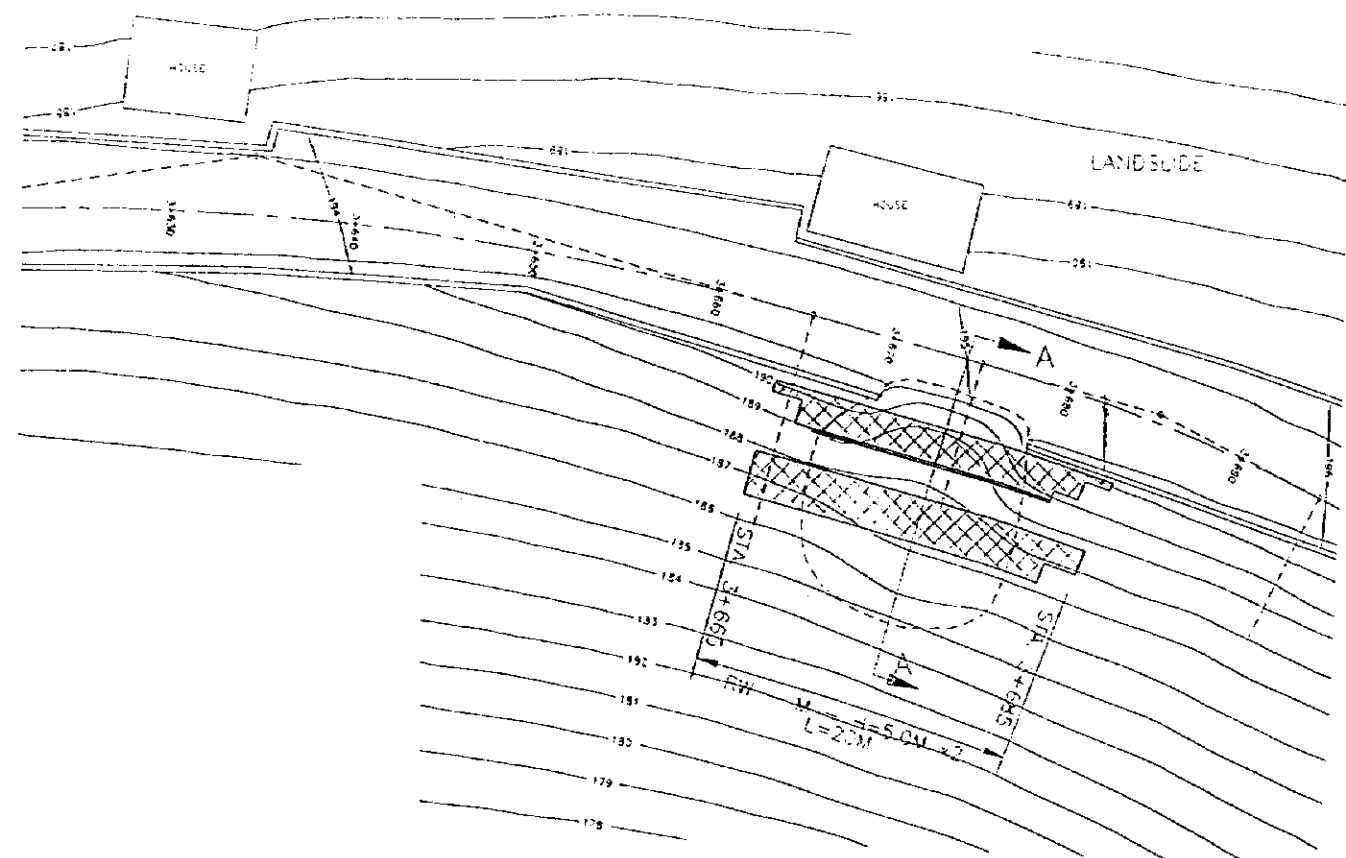
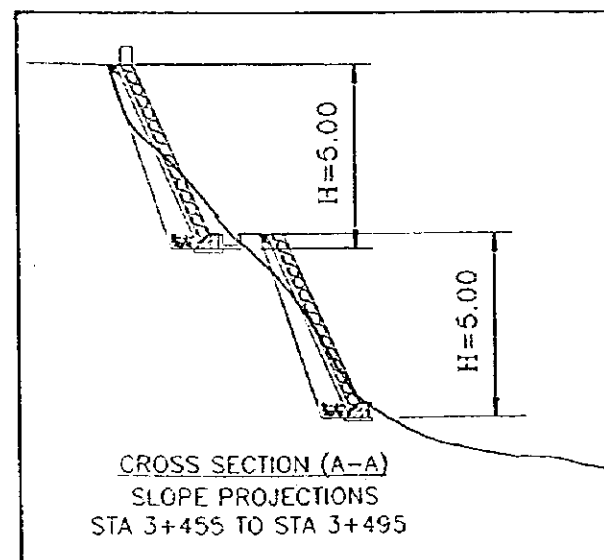
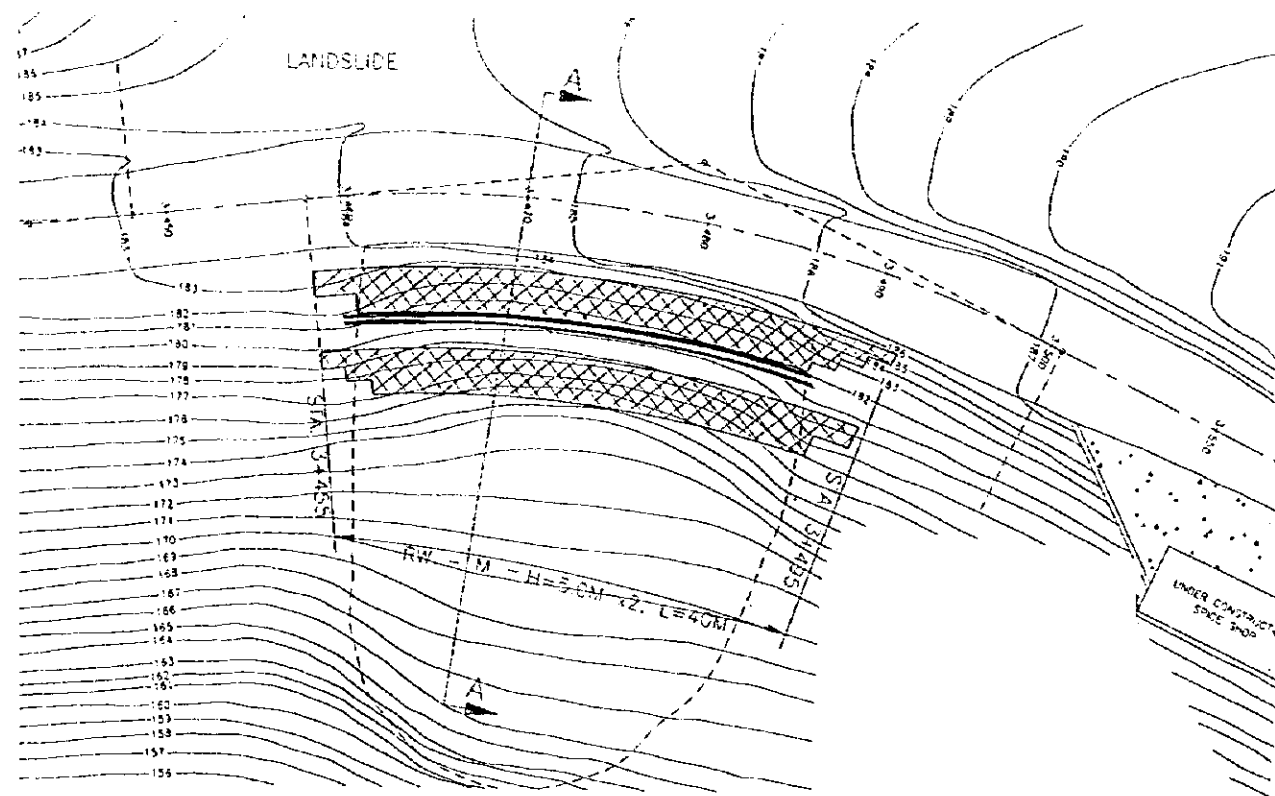


FEASIBILITY STUDY ON ROAD IMPROVEMENT AND REHABILITATION IN GRENADA

SCALE:
Not to Scale

Grand Etang Road (3)

DRAWING NO.
SP-3

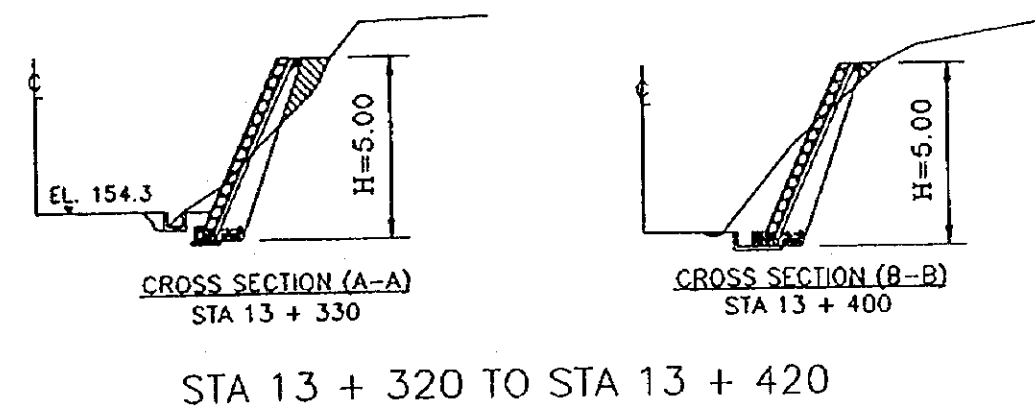
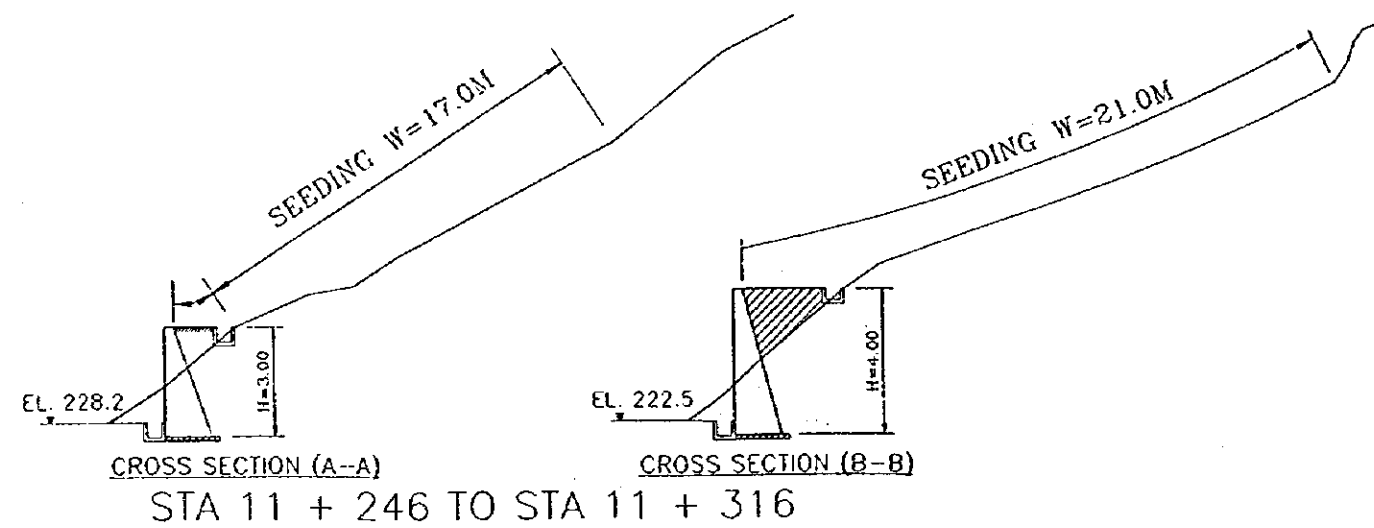
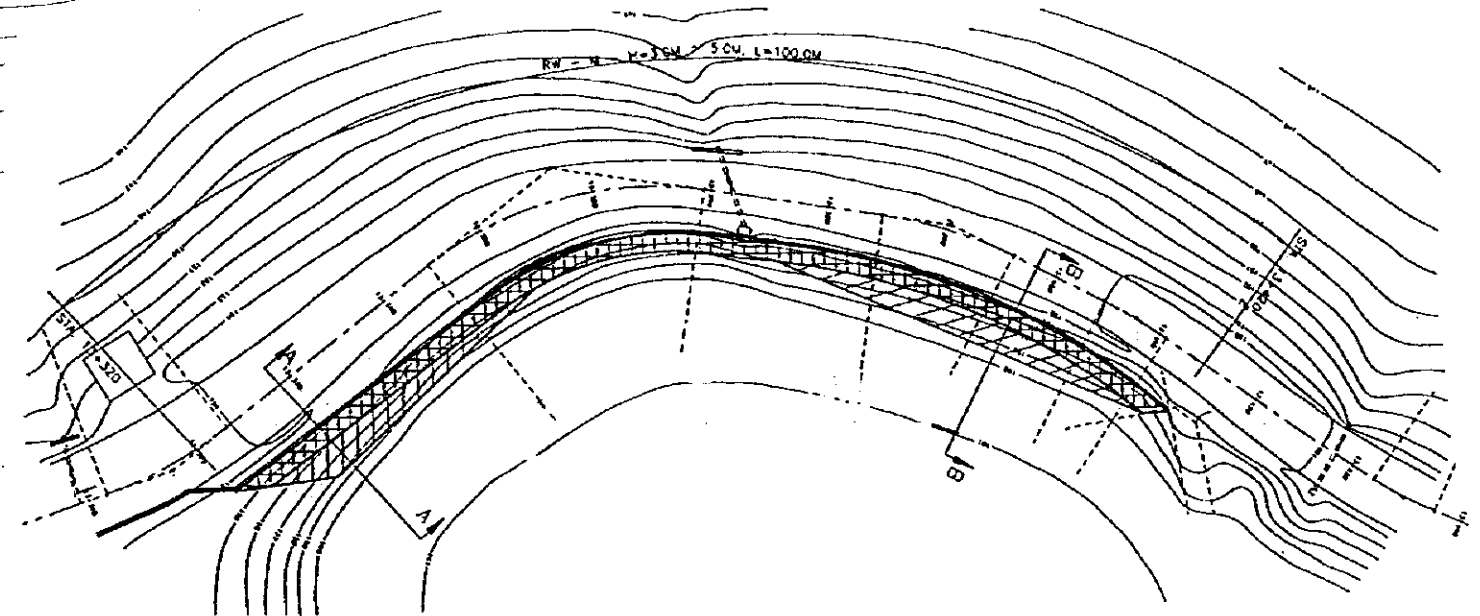
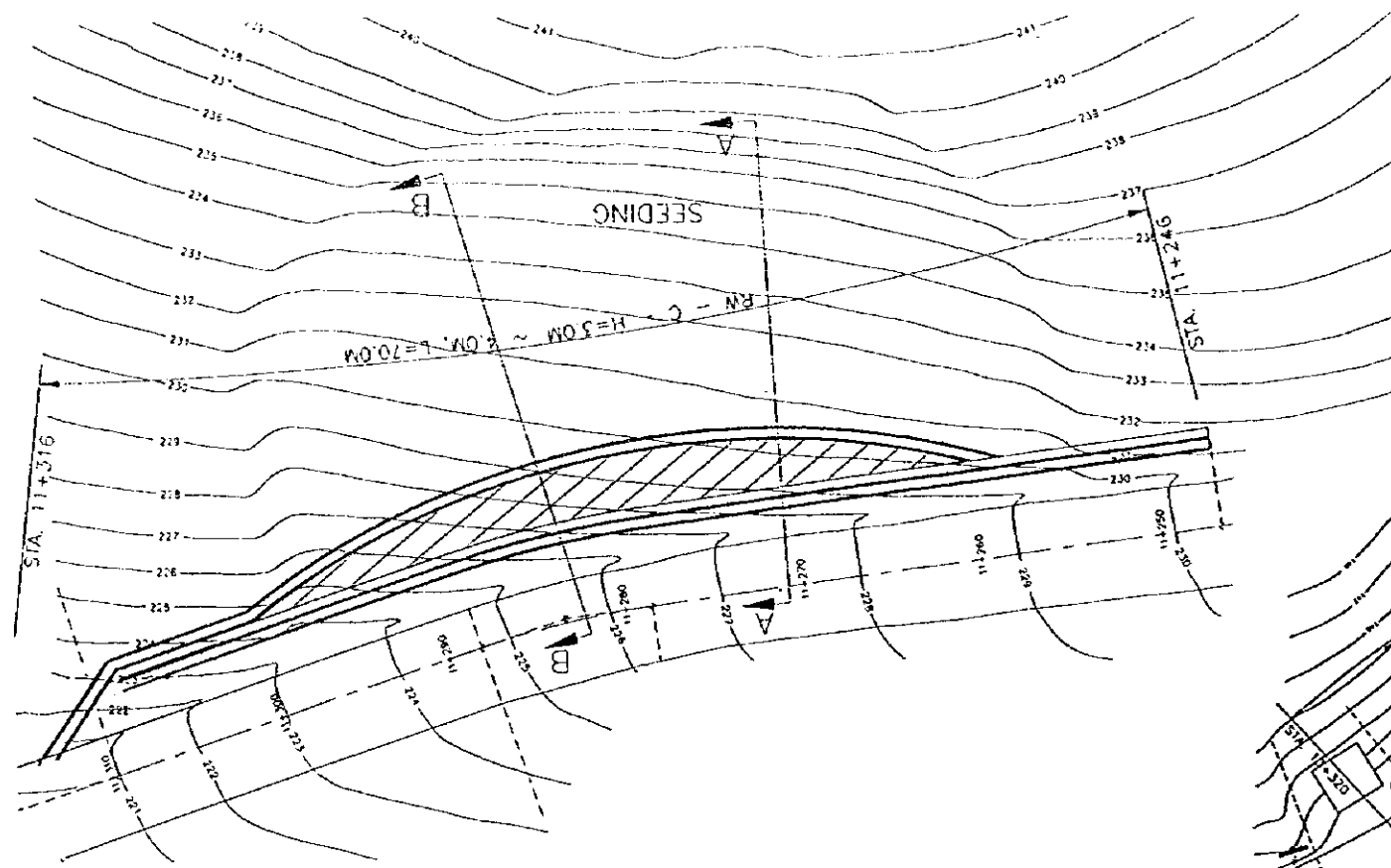


FEASIBILITY STUDY ON ROAD IMPROVEMENT AND REHABILITATION IN GRENADA

SCALE:
Not to Scale

Grand Etang Road (4)

DRAWING NO.
SP-4

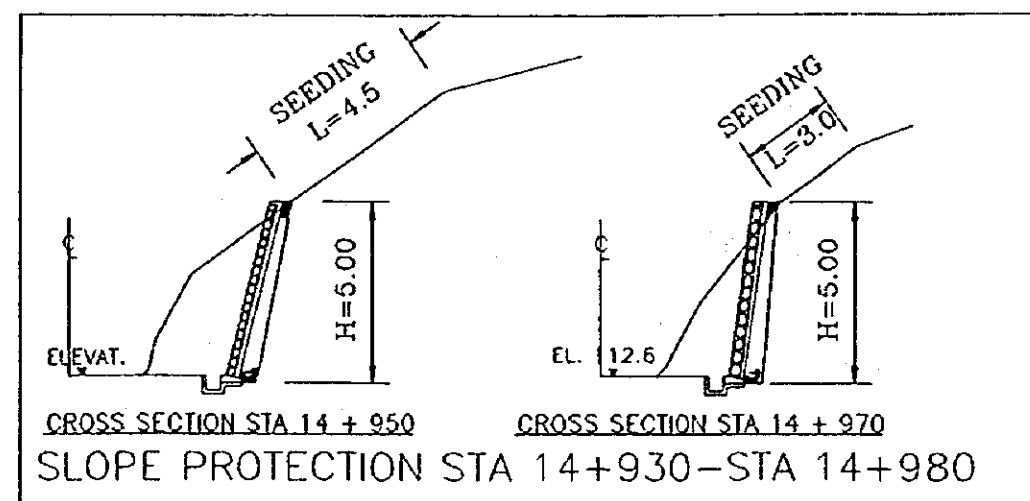
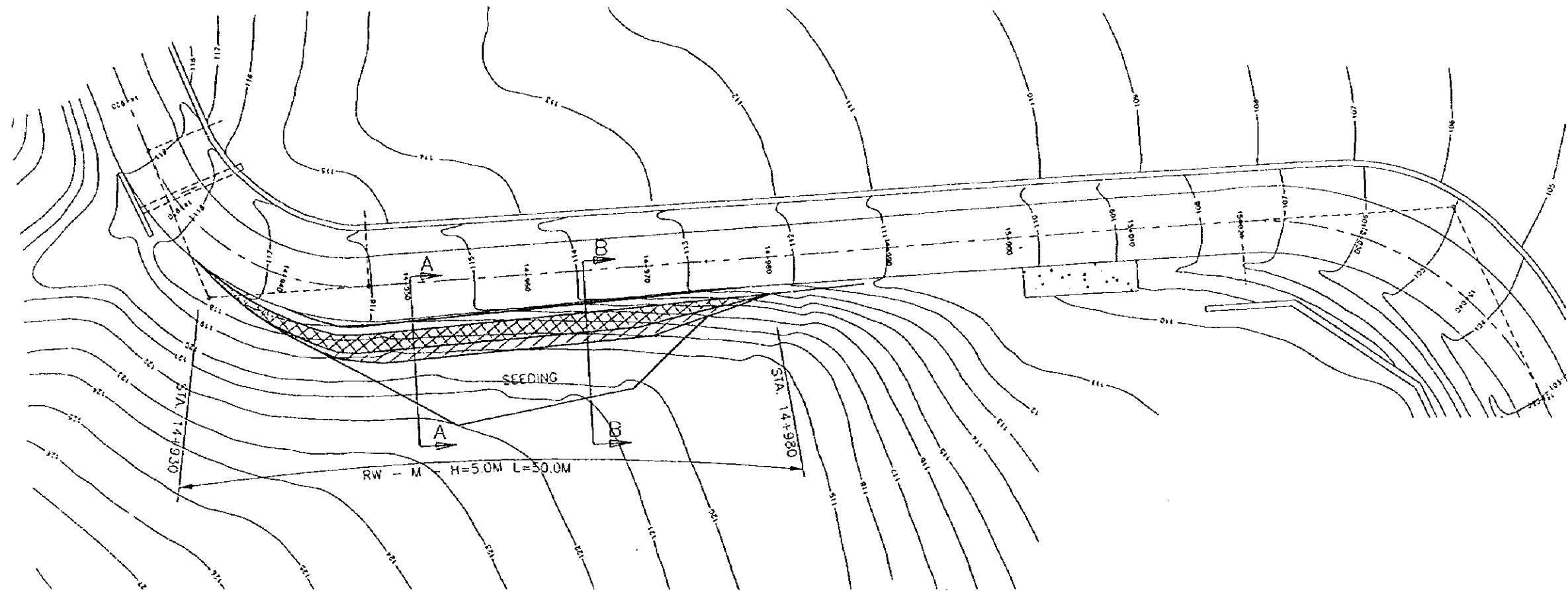


FEASIBILITY STUDY ON ROAD IMPROVEMENT AND REHABILITATION IN GRENADA

SCALE:
Not to Scale

Grand Etang Road (5)

DRAWING NO.
SP-5



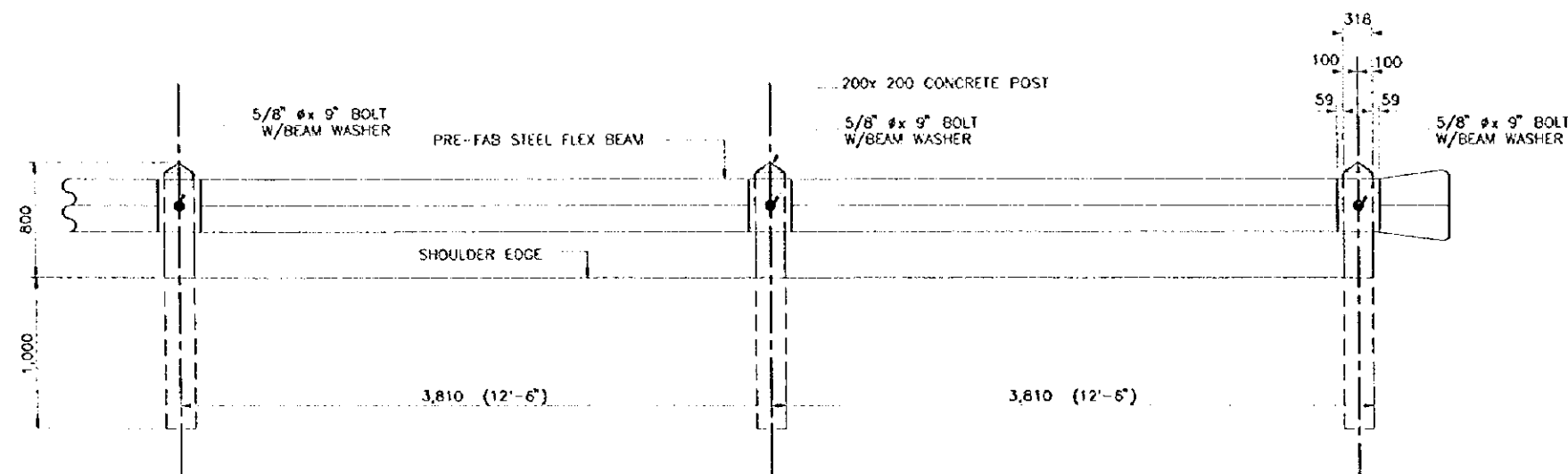
7.MISCELLANEOUS

FEASIBILITY STUDY ON ROAD IMPROVEMENT AND REHABILITATION IN GRENADA

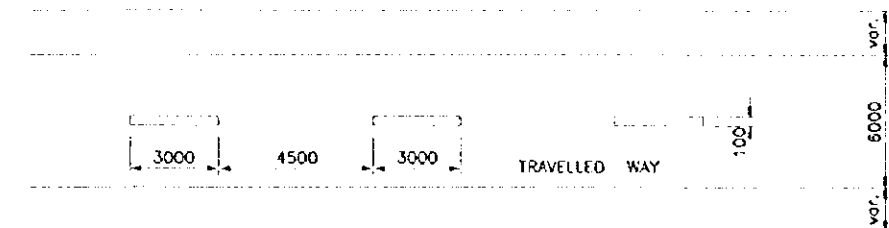
SCALE:
Not to Scale

BEAM TYPE GUARDRAIL,
CENTERLINE MARKINGS, PEDESTRIAN MARKING
& ARROW MARKING

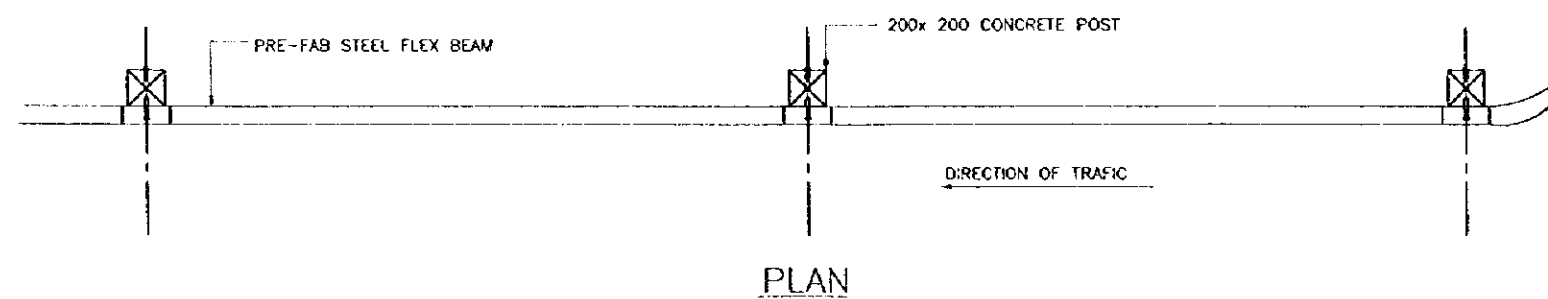
DRAWING NO.
M-1



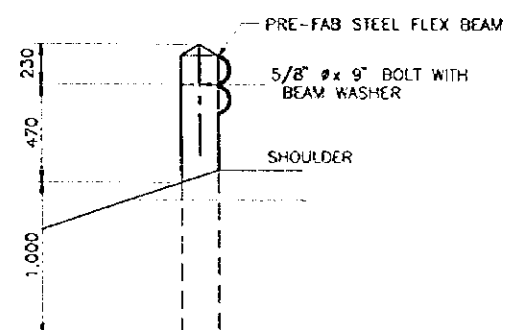
ELEVATION



CENTER LINES MARKING
RURAL HIGHWAY, TWO-LANE

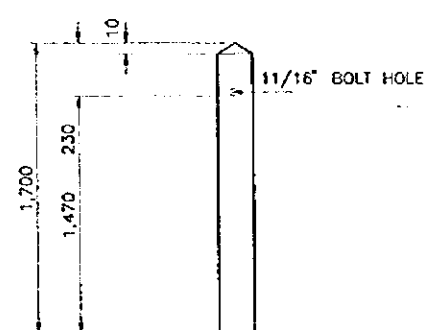


PLAN

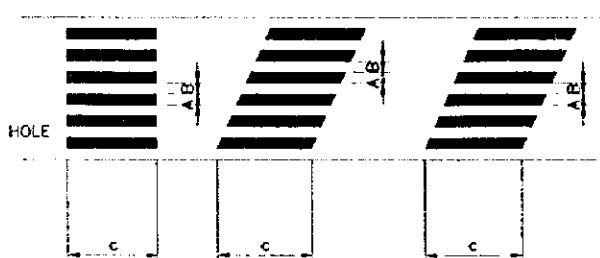


SECTION

BEAM TYPE GUARD RAIL
TYPE "Gr-A"

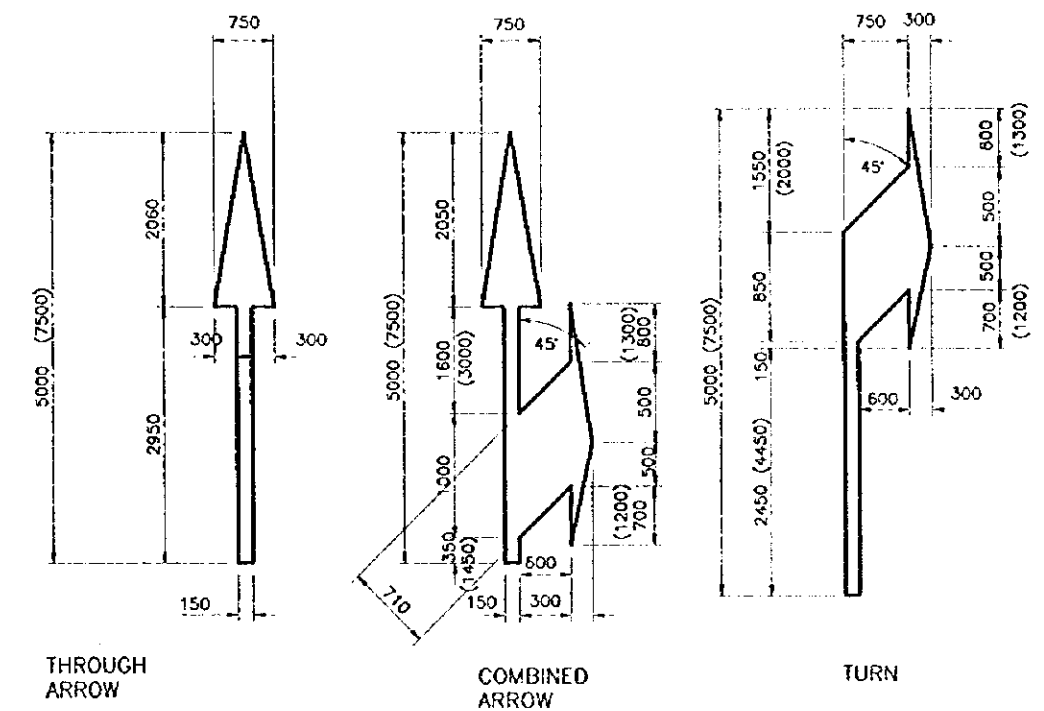


ELEVATION
CONC. POST DET



PEDESTRIAN CROSSING

NOTE:
FOR 85%ile SPEED < 60 kph
A=B=300mm C=2.5 m - 4.0 m
FOR 85%ile SPEED > 60kph
A=B 600mm C>4.0m

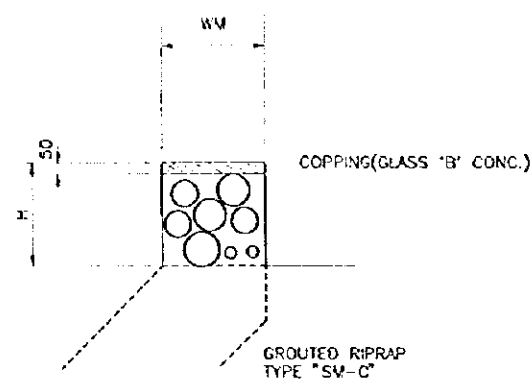


ARROW MARKINGS

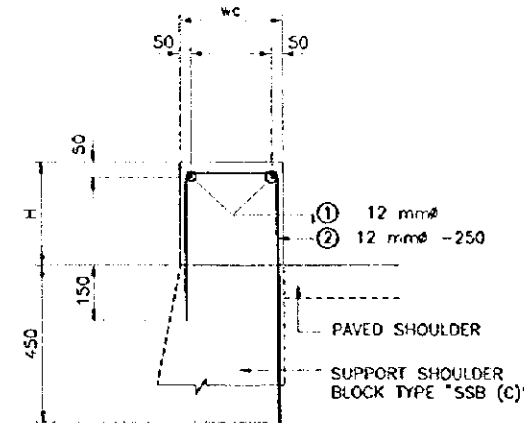
NOTE: () FOR ROADS WITH SPEED
LIMIT OVER 60KM/h

FEASIBILITY STUDY ON ROAD IMPROVEMENT AND REHABILITATION IN GRENADA

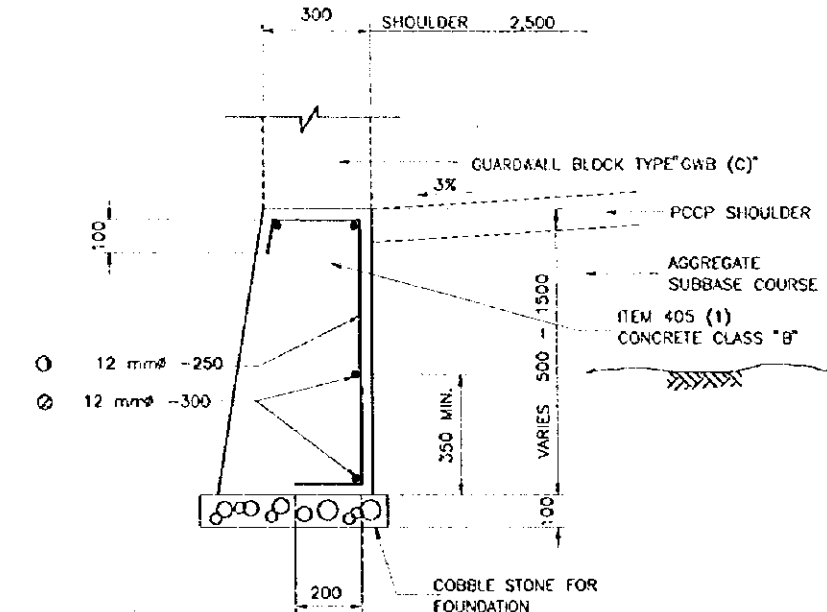
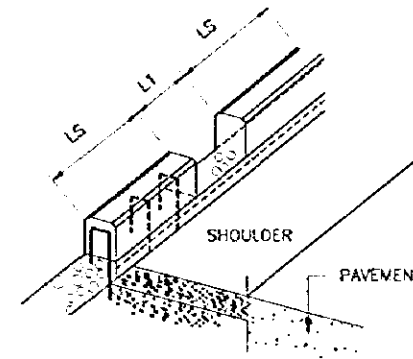
SCALE:	GUARDWALL BLOCK, SUPPORTING SHOULDER BLOCK STONE MASONRY (CUT EMBANKMENT & GRAVITY TYPE)	DRAWING NO.
As Shown		M-2



GUARDWALL BLOCK TYPE "GWB" (M)
GUARDWALL BLOCK
SCALE: 1:10

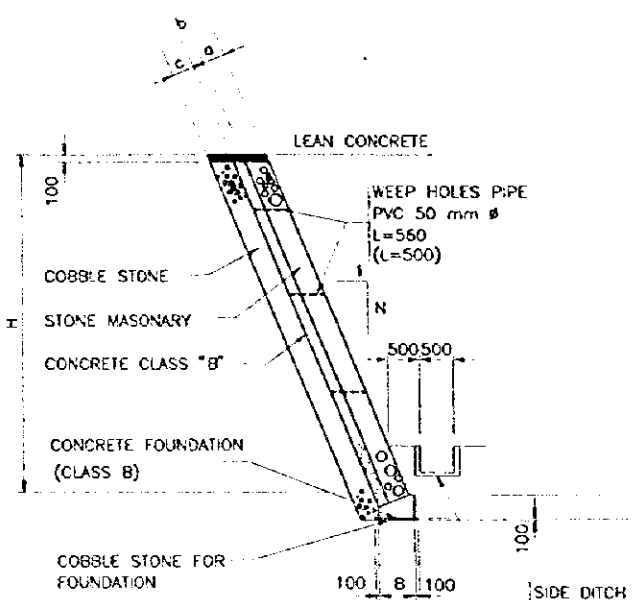


PERSPECTIVE OF GUARDWALL BLOCK
SCALE: 1:10

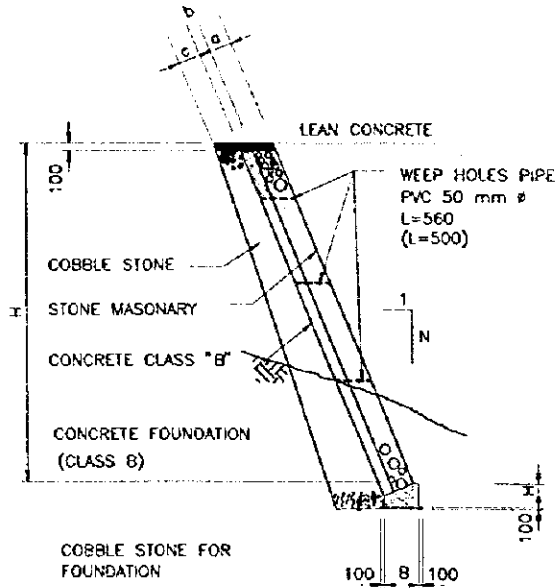


SUPPORTING SHOULDER BLOCK
SCALE: 1:20

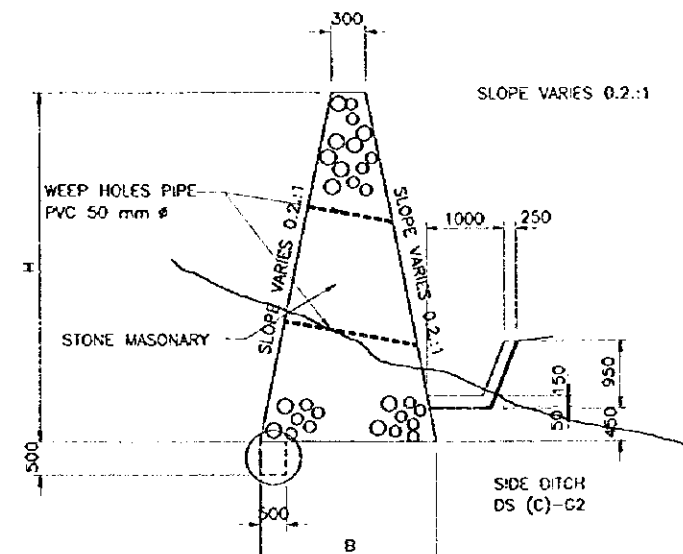
TYPE "SSB" (C)



STONE MASONRY CUT SLOPE
SCALE: 1:50
TYPE (SM)-B



STONE MASONRY EMBANKMENT SLOPE
SCALE: 1:50
TYPE (SM)-A



STONE MASONRY GRAVITY WALL
SCALE: 1:50

TYPE RW (M) A AND B

FOR CUT SLOPES						
H	N	a	b	c	B	h
1000	3.3	250	50	300	520	300
2000	3.3	250	100	300	520	300
3000	3.3	250	100	300	520	300
4000	2.5	350	150	300	550	350
5000	2.5	350	150	300	550	350
6000	2.0	350	200	300	550	350
7000	2.0	350	200	300	550	350

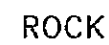
FOR EMBANKMENT SLOPE								
H	N	a	b	c	d	B	h	
1000	3.3	350	100	200	300	520	300	
1500	3.3	350	100	200	340	520	300	
2000	2.5	350	100	200	380	520	300	
2500	2.5	350	100	200	420	520	300	
3000	2.5	350	100	200	460	520	300	
3500	2.0	350	150	200	500	550	350	
4000	2.0	350	150	200	540	550	350	
4500	2.0	350	150	200	580	550	350	
5000	2.0	350	150	200	620	550	350	

ESTIMATE OF QUANTITIES STONE MASONRY GRAVITY WALL (PER 10.0 L.M.)			
H	B	QUANTITIES	
		STONE MASONRY (SQ)	PVC PIPE (MM)
2000	1100	14.00	9
3000	1500	27.00	20
4000	1900	44.00	28
5000	2300	65.00	36

NOTES

- ALL DIMENSIONS ARE IN MILLIMETER UNLESS OTHERWISE STATED.
- FOR EVERY 2.00 SQ. M. PROVIDE 50mm # PVC WEEPHOLE

SCALE:	CONCRETE RETAINING WALL	DRAWING NO.
N.T.S.		M-3



TYPICAL SECTION
REINFORCED CONCRETE RETAINING WALL
NOT TO SCALE

DIMENSION OF RETAINING WALL					
SYMBOL	UNIT	H= 2.00m		H= 2.50m	
		EMBANKMENT	CUT	EMBANKMENT	CUT
		ROCK & COMMON SOIL		ROCK & COMMON SOIL	
		TYPE 12	TYPE 13	TYPE 14	TYPE 15
H	m	2.00	2.00	2.50	2.50
B	m	1.30	1.30	1.60	1.20
H1	m	1.70	1.70	2.20	2.20
H2	m	0.30	0.30	0.30	0.30
D1	m	0.30	0.30	0.30	0.30
D2	m	0.30	0.30	0.30	0.30
D3	m	0.70	0.50	1.00	0.70
E	m	0.50	0.50	0.50	0.50

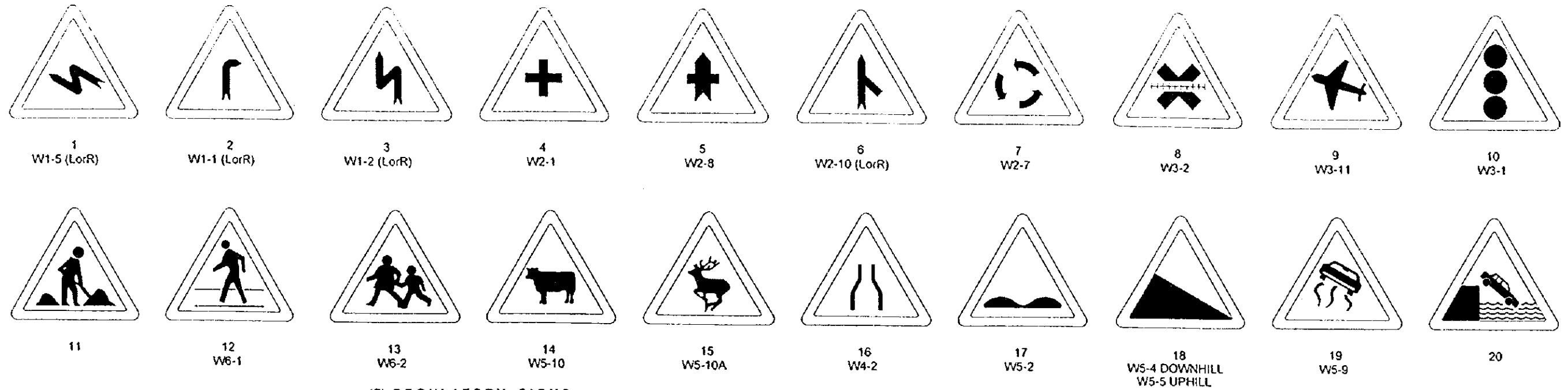
FEASIBILITY STUDY ON ROAD IMPROVEMENT AND REHABILITATION IN GRENADA

SCALE:
Not to Scale

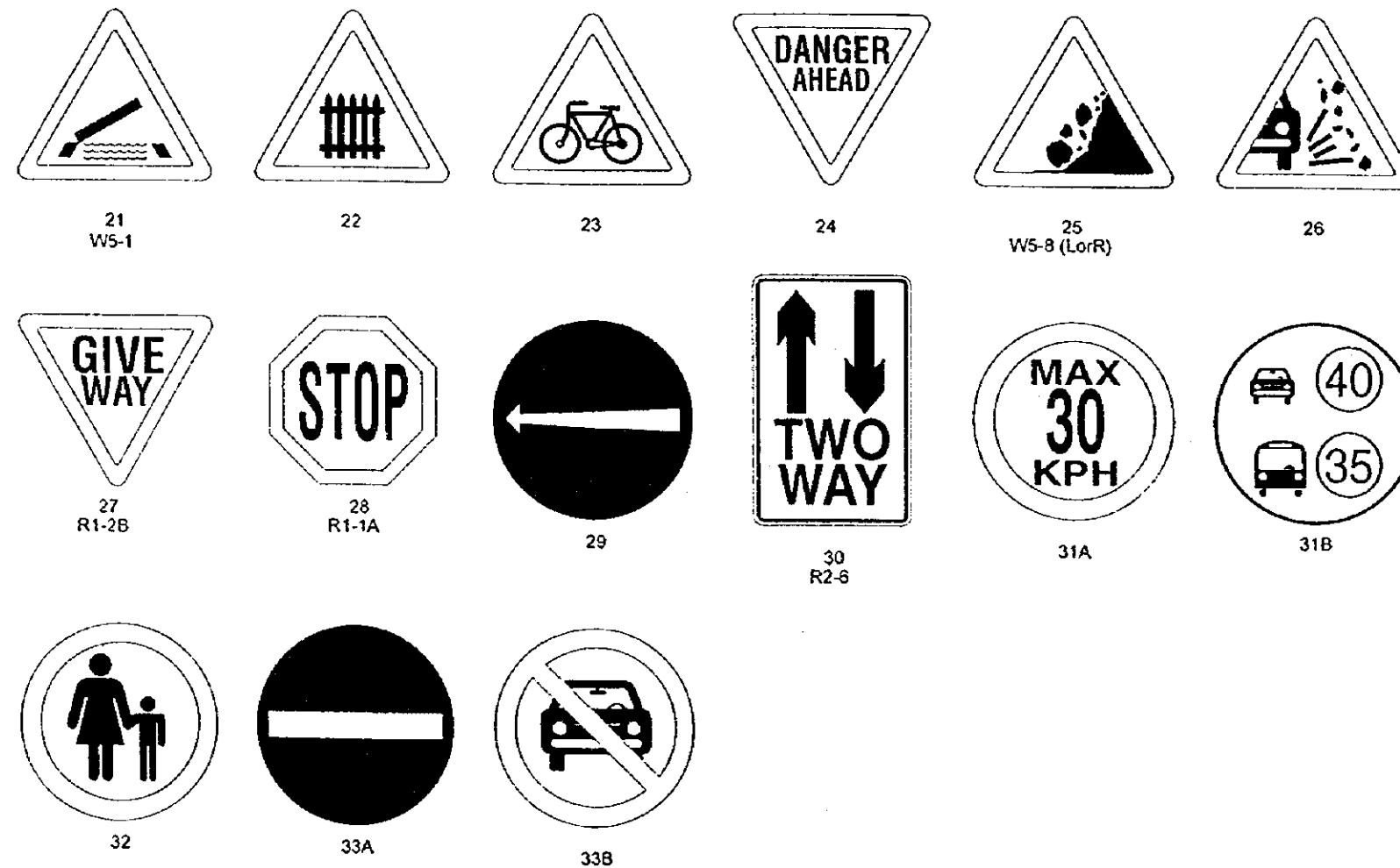
TRAFFIC SIGNS

DRAWING NO.
M-4

(A) WARNING SIGNS



(B) REGULATORY SIGNS



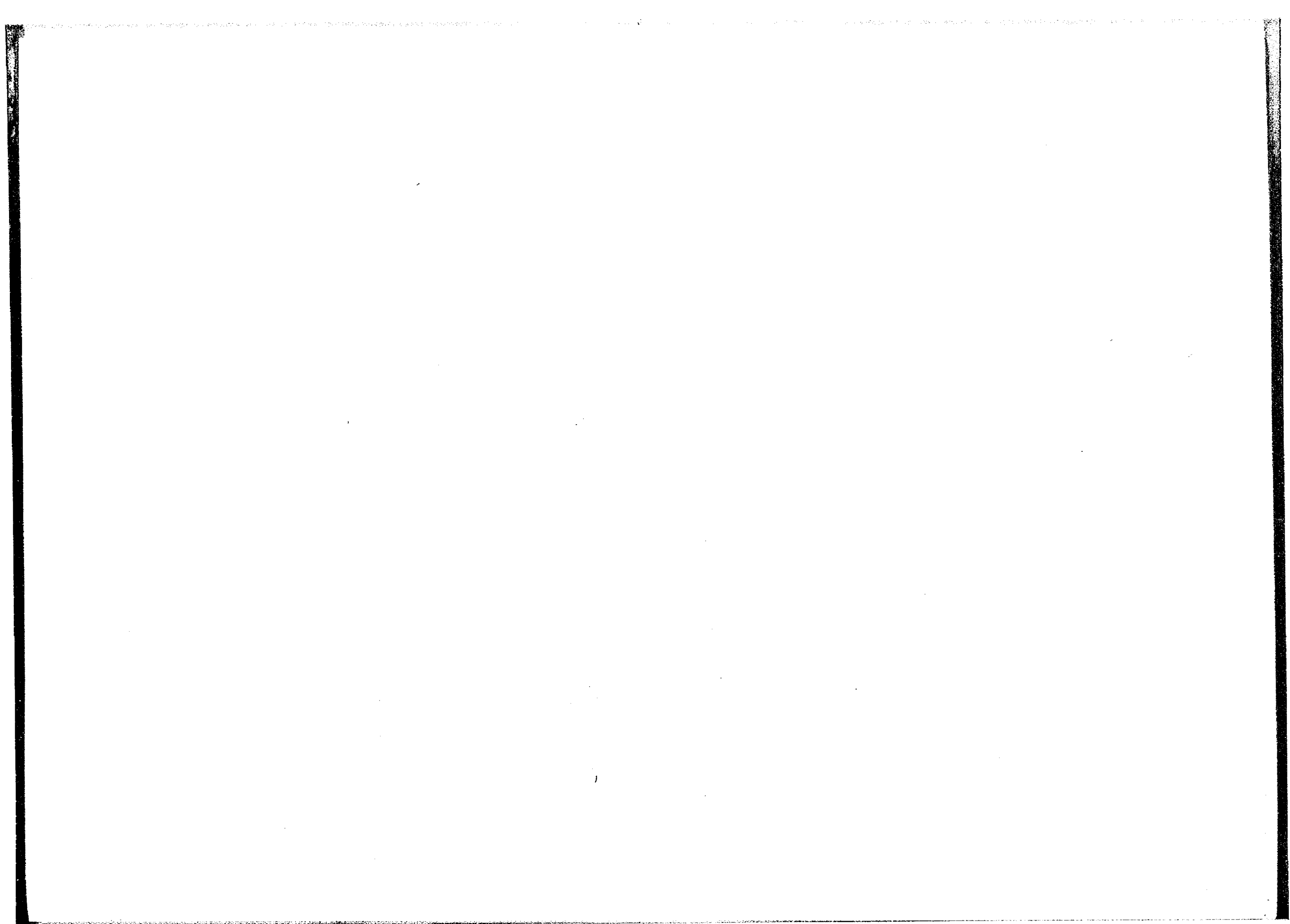
LEGEND:

A. WARNING SIGNS

1. DANGEROUS BEND (W1-5)
2. RIGHT AND LEFT BEND (W1-1)
3. DOUBLE BEND (W1-2)
4. INTERSECTION (W2-1)
5. INTERSECTION WITH HIGH PRIORITY ROAD (W2-8)
6. MERGING TRAFFIC (W2-10)
7. ROUNDABOUT AHEAD (W2-7)
8. RAILWAY CROSSING (W3-2)
9. LOW FLYING AIRCRAFT (W3-11)
10. TRAFFIC SIGNALS AHEAD (W3-1)
11. ROAD WORKS
12. PEDESTRIAN CROSSING (W6-1)
13. CHILDREN CROSSING (W6-2)
14. BEWARE OF ANIMALS (W5-10)
15. ANIMALS CROSSING (W5-10A)
16. ROAD NARROWS (W4-2)
17. UNEVEN ROAD (W5-2)
18. DANGEROUS HILL (W5-4)
19. SLIPPERY ROAD (W5-9)
20. QUAY OR RIVER BANK
21. OPENING BRIDGE (W5-11)
22. LEVEL CROSSING WITH GATES
23. COMPULSORY CYCLE TRACK
24. DANGER AHEAD
25. DANGER FROM FALLING ROCKS (W5-8)
26. LOOSE CHIPPINGS

B. REGULATORY SIGNS

27. PRIORITY ROAD AHEAD (R1-2B)
28. STOP AT INTERSECTION (R1-1A)
29. DIRECTION TO BE FOLLOWED (R2)
30. TWO WAY TRAFFIC (R2-6)
31. SPEED LIMIT (R4)
32. COMPULSORY WAY FOR PEDESTRIANS
- 33A. NO ENTRY (ALL VEHICLES)
- 33B. NO ENTRY (CAR ONLY)



JICA